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TOJDE

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Dear TOJDE Readers,

Welcome to Volume 22 Issue 4 of TOJDE.

There are 17 articles and two book reviews in the October 2021 issue of TOJDE. 49 authors from 13 different countries contributed to the issue. These countries are Brazil, China, Germany, Iran, Italy, Jordan, Pakistan, Philippines, Russia, Saudi Arabia, South Africa, Turkey and United Arab Emirates.

COURSE SATISFACTION AND STUDENT ENGAGEMENT IN ONLINE LEARNING AMID COVID-19 PANDEMIC: A STRUCTURAL EQUATION MODEL authored by Erick T. BALORAN, Jenny T. HERNAN and Janice S. TAOY is the first article. This study is designed to determine the significant relationship between course satisfaction and student engagement in online learning during the COVID-19 pandemic in the University of Mindanao, Bansalan College, Philippines. Results showed students' high level of course satisfaction and engagement with online learning delivery. Students have the same level of satisfaction on online learning delivery quality but have different online learning engagement levels as to year level. Also, this study reveals that online course satisfaction is significantly correlated with online student engagement.

The 2nd article, ACADEMIC PROCRASTINATION AND PERFORMANCE IN DISTANCE EDUCATION: A CAUSAL-COMPARATIVE STUDY IN AN ONLINE LEARNING ENVIRONMENT, is written by Hasan UCAR, Aras BOZKURT and Olaf ZAWACKI-RICHTER. This research indicates that academic procrastination is a common attitude among learners, and that it generally has a negative correlation with academic performance. The present quantitative causal-comparative study aims to determine the cause of differences, in terms of procrastination tendency, in academic performance among online learners. Results highlight that academic procrastination tendency is an important indicator for predicting the academic achievements of online learners.

The title of the 3rd is AN OPEN ONLINE COURSE TO ENHANCE DIGITAL COMPETENCES OF TEACHERS. The authors are Bengusu UGUR, Selay ARKUN KOCADERE, Pinar NUHOGLU KIBAR and Fatma BAYRAK. The purpose of this study is to design an online professional development program and evaluate the developed course in light of the implementation results. This course provides teachers with the opportunity to develop an ICT-enhanced lesson plan and apply it in their own classes.

Alessandro Silva de OLIVEIRA, Matheus Alberto Rodrigues SILVA, Dirceu da SILVA and Richardson Coimbra BORGES are the authors of the 4th article. This article is titled QUALITY ASSESSMENT OF ONLINE DISCUSSION FORUMS: CONSTRUCTION AND VALIDATION OF A SCALE THAT VALUES STUDENT PERCEPTION. The aim of this paper is to develop and validate a Quality Perception of Online Discussion Forums (QPODF) scale. To this end, quantitative research is carried out with students of postgraduate courses lato sensu the online distance education. The results demonstrate that the quality of the construct perceived online discussion forums has two dimensions: "Forum Structure" and "Forum Mediation."

INNOVATIVE APPROACHES IN DEVELOPMENT OF EDUCATIONAL MATERIALS: A CASE STUDY OF SCIENCE TEACHERS is the title of the 5th article, and the authors are Munise SECKIN KAPUCU, Zeynep YURTSEVEN AVCI and Irfan SURAL. This study aims to examine experiences of science teachers in the training process they attended for innovative technology applications. Case study method, one of the qualitative research methods, is used for study design. The results indicate, teachers found innovative technologies positive in terms of attracting student attention, increasing involvement of the students, and facilitating/concretizing learning; and negative in terms of causing distraction and technology dependence.

The authors of the 6th article are Amin Ullah KHAN, Kashif Ullah KHAN, Fouzia ATLAS, Sadia AKHTAR and Farhan KHAN. The title is CRITICAL FACTORS INFLUENCING MOOCS RETENTION: THE MEDIATING ROLE OF INFORMATION TECHNOLOGY. This paper investigates the impact of critical factors such as the instructor's role, course relevancy, learning outcomes on MOOCs retention. Also, this study analyzes the mediating role of IT (Social Media) between critical factors and MOOCs retention and provides feasible solutions for the improvement of MOOCs retention rates.

The title of the 7th article is AN INVESTIGATION OF MATHEMATICS TEACHERS' EMERGENCY REMOTE TEACHING EXPERIENCES. Ayla ATA BARAN and Hakan BARAN are the authors. The purpose of this study is to examine the evaluations of mathematics teachers' emergency remote teaching experiences. As a result, it is seen that participating teachers' current understanding of the concept of distance education has influenced the way they conduct their online lessons.

INVESTIGATION OF THE ATTITUDES DISTANCE EDUCATION OF THE FACULTY OF SPORT SCIENCE STUDENTS IN THE COVID-19 PERIOD is the 8th article, and the authors are Yasin KARACA and Mehmet ILKIM. This study aims to examine the attitudes of the Faculty of Sport Sciences Students education in the period of COVID-19 according to gender, class, regular internet access status, courses attendance status, the device in which the courses were followed, the environment to attend courses and viewing distance education useful variables. The results indicates, the students found the distance education applied in COVID-19 period beneficial.

Dincer SARAL and Seray OLCAY are the authors of the 9th article. The title of this article is TELEHEALTH FOR FAMILIES OF CHILDREN WITH SPECIAL NEEDS: EXPERTS' OPINIONS. This qualitative study aims at describing the opinions and recommendations of the experts toward the basic characteristics of Telehealth interventions (TI), guidelines for successful practices, ethical considerations, potential problems, and solutions associated with TI process. According to the authors, the findings may guide future practitioners, researchers, or teachers in conducting or investigating the effectiveness of TI.

The 10th article is TEACHERS' ATTITUDES AND OPINIONS ON MATHEMATICS LESSONS CONDUCTED WITH DISTANCE EDUCATION DUE TO COVID-19 PANDEMIC. The authors are Baris DEMIR, Gul KALELI YILMAZ and Hulya SERT CELIK. This study concentrates on determining attitudes of teachers towards distance mathematics education and examining their views based on some variables. The result of the study demonstrated that attitudes of teachers towards distance mathematics education.

The 11th article which is authored by Caroline M. AZIONYA and Abyshey NHEDZI is titled THE DIGITAL DIVIDE AND HIGHER EDUCATION CHALLENGE WITH EMERGENCY ONLINE LEARNING: ANALYSIS OF TWEETS IN THE WAKE OF THE COVID-19 LOCKDOWN. The study reveals the perceptions and experiences of university students from historically marginalized and privileged universities. Results reveal, online learning did not increase the accessibility of university education during the pandemic for students attending marginalized universities.

The title of the 12th article is IMPLEMENTING FLIPPED CLASSROOM MODEL IN DEVELOPING BASIC LANGUAGE ARTS OF THE FOURTH GRADE STUDENTS, and the author is Mehmet Fatih KAYA. This study aims to examine the role of the Flipped Classroom Model (FCM) in the development of the basic language skills of 4th grade students in Turkish language lesson. According to results, the activities carried out during the implementation contributed to the development of language skills of the students.

The 13th article, BARRIERS TO ONLINE LEARNING: ADJUSTING TO THE 'NEW NORMAL' IN THE TIME OF COVID-19, is authored by Abeer Aidh ALSHWIAH. This study specifically examines the barriers facing Secondary school students, providing suggestions for overcoming these barriers, as gathered from educational technology specialists. The results show that experts agreed on the need for a virtual learning environment (VLE) that would help develop students' self-learning, research, and critical thinking skills.

Yasemin TAS, Selma EMINOGLU, Gulsah ATILA, Yasemin YILDIZ and Ummugulsum BOZKURT are the writers of the 14th article. The title is TEACHERS' SELF-EFFICACY BELIEFS AND OPINIONS ABOUT DISTANCE EDUCATION DURING THE COVID-19 PANDEMIC. This study investigated teaching self-efficacy beliefs and opinions about distance education of teachers in Turkey who switched to distance education during the COVID-19 pandemic. As a result, suggestions are made to make distance education more effective.

VISUALIZATION OF DATA ANALYSIS FOR EVALUATION OF THE LEVEL OF IT-SPECIALISTS COMPETENCIES' CREATION is the 15th article and the authors are Oksana GUSHCHINA and Oksana ANIKINA. In the study, the authors show how visualization and analysis of education data could be used in simulation and adjustment of education program curriculum for future evaluation of the formation levels the graduates competences as specified by educational standard. The authors suggest the scenario that demonstrate the possibility of automatic evaluation of graduate competences formation.

Manal BAYYAT, Zainab ABU MUAILI and Lujayn ALDABBAS are the authors of the 16th article titled ONLINE COMPONENT CHALLENGES OF A BLENDED LEARNING EXPERIENCE: A COMPREHENSIVE APPROACH. This study aims to investigate: (1) the construct validity of the "Blended Learners' Online Component Challenges" BLOCC scale. (2) the internal reliability of the scale, and (3) the differences between blended learners' online component challenges according to different socio-demographic variables for Sport Science students.

The 17th article is titled CO-CREATION APPLIED TO INNOVATION FOR BRANDING ONLINE DISTANCE EDUCATION. The author is Farooq HAQ. This exploratory qualitative research investigates branding innovation for online distance education in Australian regional universities. The purpose is to apply co-creation to specify the type of innovation and branding approach for online distance education. The research purpose was achieved by studying two regional universities in Australia. Research outcomes cover a gap in literature on branding online distance education for innovation based on co-creation. This study could be replicated in other countries including Turkey to investigate factors affecting innovation for branding distance education.

There are two book reviews in this issue. TEACHING IN A DIGITAL AGE: GUIDELINES FOR TEACHING AND LEARNING is the title of the first book. The author of this book Anthony William (Tony) BATES. The reviewer is Mohsen KESHAVARZ.

Other book's title is ADOPTION OF DATA ANALYTICS IN HIGHER EDUCATION LEARNING AND TEACHING. Dirk IFENTHALER and David GIBSON are the editors of this book. Seyda KIR and Murat ARTSIN are the reviewers.

Hope to meet again in the next issue of TOJDE.

Cordially,

Dr. T. Volkan YUZER

Editor in Chief

# COURSE SATISFACTION AND STUDENT ENGAGEMENT IN ONLINE LEARNING AMID COVID-19 PANDEMIC: A STRUCTURAL EQUATION MODEL

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## ABSTRACT

The adoption of online learning modality among Higher Education Institutions increased exponentially amid the COVID-19 pandemic. As the universities shifted from onsite learning to online learning, course satisfaction and student engagement became the emerging concern among teachers. This study was designed to determine the significant relationship between course satisfaction and student engagement in online learning during the COVID-19 pandemic in the University of Mindanao – Bansalan College, Philippines. A total of 529 university students responded to the online survey. Results showed students' high level of course satisfaction and engagement with online learning delivery. Students have the same level of satisfaction on online learning delivery quality but have different online learning engagement levels as to year level. Also, this study revealed that online course satisfaction was significantly correlated with online student engagement. Through structural equation modeling, it was further specified that online course satisfaction is significantly related to students' skills engagement, emotion engagement, participation engagement, and performance engagement as constructs of student engagement in online learning. Higher Education Institutions (HEIs) need to improve online learning delivery quality in the new normal setting amid the COVID-19 pandemic and ensure to fill the gap between those students from advantaged and underprivileged backgrounds.

**Keywords:** Course satisfaction, student engagement, online learning, COVD-19 pandemic, Structural Equation Model.

## INTRODUCTION

The sudden outbreak of COVID-19, a deadly disease, shook the whole world. It was declared a pandemic by the World Health Organisation. This pandemic has caused several schools and colleges to remain closed temporarily. Many places are impacted globally, and there is a fear of missing a semester or even more soon. Onsite instruction has been abandoned by numerous schools, colleges, and universities, and the standard approach to teaching has been modified. Such circumstances cause educational institutions around the world to force teachers to move to an online teaching mode. There was no choice but to switch entirely to online teaching-learning for several academic institutions that were previously unwilling to shift their conventional pedagogical approach (Dhawan, 2020). In China, where the COVID-19 pandemic came from, online education among its universities has been increasingly introduced after the virus outbreak. There has been a change from normal classrooms to e-classrooms overnight, i.e., educators have changed their whole pedagogical approach to meet emerging market dynamics and adjust to changing circumstances. During this challenging era, the question is not whether online teaching-learning strategies will provide quality education; instead, it is how online learning can be embraced in such a big way by academic institutions (Carey, 2020).

Generally, online learning has many opportunities available, but as most academic institutions have moved to this model, this period of crisis will cause online learning to boom. During the COVID-19 pandemic, online learning, remote working, and e-collaboration exploded. Amid this crisis, however, e-learning has some drawbacks because it can hamper contact between the learner and the instructor, i.e., direct communication and lack of human touch. Users may face several technical challenges that hinder and slow down the process of teaching and learning (Favale et al., 2020). Countries like Switzerland, Norway, Austria, United States, Australia, and Indonesia face problems in online education in terms of the significant gap between those students from privileged and disadvantaged backgrounds. While some schools and governments have been providing digital equipment to students in need, many are still concerned that the pandemic will widen the digital divide (Li & Lalani, 2020).

The COVID-19 crisis has also affected the context of education in the Philippines. Classes were postponed due to lockdown. The majority of universities and colleges have faced virtual learning challenges (Talidong & Toquero, 2020). Besides, students were unwilling to implement the online-blended learning approach (Baloran, 2020). Nevertheless, despite difficulties, online learning can also bring significant improvements in students ‘ learning experiences. Students can learn and interact with teachers and other students independently (Singh & Thurman, 2019). The synchronous learning environment is structured because students attend live lectures, there are real-time interactions between teachers and learners, and instant feedback is possible (Littlefield, 2018). Likewise, synchronous learning can provide many social interaction opportunities (McBrien et al., 2009). Such online platforms are needed amid this deadly virus where video conferencing, discussions with students can be carried out to keep classes organic, internet connections are good, lectures are accessible on mobile phones as well, and not just laptops, the ability to watch already recorded lectures, and immediate student feedback can be obtained, and assignments can be taken (Basilaia et al., 2020).

Previous studies on students’ satisfaction towards online learning were conducted even before the COVID-19 pandemic. Singh and Min (2017) studied the level of satisfaction of students with e-learning, and it was found that the majority of students accepted digital learning. Mamattah (2016) also revealed that students were satisfied with online learning compared to face-to-face learning. However, several authors have indicated that students prefer face-to-face teaching over online teaching (Bali & Liu, 2018; Qureshi et al., 2012). Similarly, during COVID-19, expectations of students about e-learning were explored in the study conducted by Abbasi et al. (2020). During the lockdown case, students didn’t choose e-teaching over face-to-face teaching. In their report, it was proposed that the administration and faculty members should take the requisite steps to improve e-teaching during lock-down for better learning.

Higher education institutions consider student satisfaction to be one of the main factors determining their online learning quality, especially with student engagement. Student satisfaction with online learning can be linked to many factors, such as online interactions including student-student, student-instructor, and student-content, and also the quality of course, evaluation, self-efficacy of computer and internet, perceived learning and student learning can be influenced by student satisfaction with the learning experience. If students are pleased with their online learning experience, this will decide whether they are more likely to choose to participate in other online courses (Bayrak et al., 2020).

Therefore, student engagement is another critical concern in online learning. The standard of learning has become online learning, and a significant number of students engage in it. The nature of online learning is the continuing growth of students' cognitive level, and students need to engage actively in learning to achieve successful understanding. However, some experiences of students who engage in online learning are not satisfactory because of the lack of contact between teachers and students, and their persistence and effectiveness are also lacking. There are instances where teachers cannot understand the degree of engagement of students, especially the degree of emotional engagement. Therefore, in the online learning environment, it is essential to evaluate and research student engagement, help teachers understand student engagement and intervene in time, help students reflect on their learning actions, and facilitate their profound involvement in the learning process (Hu & Li, 2017; Lisha & Zhang, 2003). With these preceding contexts, colleges and universities in the Philippines are at the stage of evaluating whether online learning pedagogy amid the COVID-19 pandemic has brought tertiary learners to feel high satisfaction towards online learning and how this influences their learning engagement in terms of developing skills, emotions, participation, and performance. Also, the role of course satisfaction and student engagement in online learning in the context of new normal instruction has received little attention by most researchers to inform policy and practices in the Philippine context. This study's findings will be of significance to higher education institutions (HEIs), particularly in the University of Mindanao management, to be aware of students' course satisfaction and engagement in online learning amid the COVID-19 pandemic. This will help HEIs improve their orientation programs for both teachers and students on online learning modalities and tools and initiate actions in augmenting e-learning resources and online teaching strategies, especially in terms of content delivery and online activities and tasks.

## PURPOSE OF THE STUDY

This study investigated the significant influence of course satisfaction on student engagement in online learning at the University of Mindanao - Bansalan College amid the COVID-19 pandemic. Furthermore, this study aimed to determine the best fit model showing the interrelationships between and among course satisfaction and student engagement domains in online learning.

The study was guided by the following research questions and hypotheses:

The research questions were;

1. What is the level of course satisfaction and student engagement in online learning (in terms of skills, emotion, participation, and performance) amid the COVID-19 pandemic?
2. Is there a significant difference in the level of course satisfaction and student engagement in online learning amid the COVID-19 pandemic when analyzed by gender, age, year level, and course?
3. Is there a significant relationship between course satisfaction and student engagement in online learning amid the COVID-19 pandemic?
4. What model best fits for interpreting structural interrelationships among course satisfaction and student engagement domains in online learning amid the COVID-19 pandemic?

The hypotheses were;

1. There is no significant difference in the level of course satisfaction and student engagement in online learning amid the COVID-19 pandemic when analyzed by gender, age, year level, and course.
2. There is no significant relationship between course satisfaction and student engagement in online learning amid the COVID-19 pandemic.
3. There is no model that best fits for interpreting structural interrelationships among course satisfaction and student engagement domains in online learning amid the COVID-19 pandemic.

## METHOD

This was a cross-sectional study conducted at the University of Mindanao – Bansalan College, Philippines, from October 3 to 22, 2020, amid the community lockdowns due to the COVID-19 pandemic. The interrelationships among students' course satisfaction and student engagement domains in online learning were determined using the structural equation modeling (SEM) technique.

### Study Sample

A total of 529 university students were the respondents of the study. Students were informed about the purpose of the study, and online consent was obtained. Among the 529 university students who answered the online questionnaire, 296 (55.95%) were male, 220 (41.59) were male, and 13 (2.46%) were LGBTQ+ members. The majority of the students belonged to 20 to 25-years-old (290 or 54.82%) and was first-year students (220 or 41.59%). Also, the majority were taking law enforcement courses (368 or 69.57%) (See Table 1).

**Table 1.** Demographic Description of the Study Sample

| Characteristics | Value | |
|---|---|---|
| Gender, n (%) | | |
| | Male | 296 (55.95) |
| | Female | 220 (41.59) |
| | LGBTQ+ | 13 (2.46) |
| Age, n (%) | | |
| | Below 19 y/o | 209 (39.51) |
| | 20 -25 y/o | 290 (54.82) |
| | 26 – 30 y/o | 27 (5.10) |
| | 31 y/o and above | 3 (0.57) |
| Year Level, n (%) | | |
| | First Year | 220 (41.59) |
| | Second Year | 144 (27.22) |
| | Third Year | 127 (24.01) |
| | Fourth Year | 38 (7.18) |
| Course, n (%) | | |
| | Law Enforcement | 368 (69.57) |
| | Business Administration | 101 (19.09) |
| | Education | 33 (6.24) |
| | Management Accounting | 27 (5.10) |

### Data Collection and Analysis

The course satisfaction of students in online learning was assessed using a 10-item questionnaire adapted from the study of Bayrak et al. (2020) on the Development of Online Course Satisfaction Scale. The student engagement in online learning was also assessed using a 19-item questionnaire adapted from the study of Dixson (2015) on the Measuring Student Engagement in the Online Course: The Online Student Engagement Scale (OSE). Demographic information such as gender, age, year level, and course were also obtained. Students were asked to respond to the questionnaire items on a five-point Likert scale. Student respondents answered the online survey developed through Google forms with an appended consent form. The survey link was sent to the student respondents via social media. The study involved only those students who had access to the internet and enrolled in online learning modalities. In analyzing data, Mean was used to assess the level of course satisfaction and student engagement, and Analysis of Variance (ANOVA) was used to test the significant difference in the level of course satisfaction and student engagement in online learning when analyzed by gender, age, year level, and course. Pearson r was used to determine the significant relationship between the variables. To verify the normal distribution of the given data, the normality test (Shapiro-Wilk Test) was used. To approximate the structural model, path analysis was further incorporated into the SEM analysis. To determine the fitness of the hypothesized model, several measures were used. Finally, to better approach the direct relations between the measured variables, path analysis was used (Hair et al., 2006).

### The Scale

The test items' overall reliability was assessed by calculating Cronbach's alpha (0.897), which indicates significant internal consistency. A five point likert scale was used for measuring the levels of course satisfaction and student engagement. The following range of means with its descriptions was used: 1.00 – 1.79 (Very Low); 1.80 – 2.59 (Low); 2.60 – 3.39 (Moderate); 3.40 – 4.19 (High); 4.20 – 5.00 (Very High). The corresponding interpretation for each range starts from never to rarely, sometimes, oftentimes, and always manifested for every item in the questionnaire.

## RESULTS AND DISCUSSION

### Course Satisfaction and Student Engagement in Online Learning

The study's first objective was to investigate the level of course satisfaction and the level of student engagement in online learning in terms of skills, emotion, participation, and performance amid the COVID-19 pandemic in the University of Mindanao - Bansalan College, Philippines. As seen in Table 2, students' level of course satisfaction in online learning amid the COVID-19 pandemic is 'high' (M=3.64; SD=0.78). Data implies that in the first term of the semester, the university students are highly satisfied with how teachers communicate and provide support to students in gaining access to different online materials for course learning. Students are contented with how learning units are sequenced, scheduled, and presented using the Learning Management System (LMS) and other forms of online modalities. Teachers present lesson content online clearly and understandably. Also, students display a high level of satisfaction in terms of the speed and easy utility of the LMS and other online teaching platforms. They also see their teachers being enthusiastic in giving feedback to their performances during the online learning mode. Hence, students are highly satisfied that their learning needs are met in the online learning environment amid the COVID-19 pandemic.

**Table 2.** Levels of Course Satisfaction and Student Engagement in Online Learning

| | Course Satisfaction (Crs) | Student Engagement (SE) Domains | | | | Overall SE |
|---|---|---|---|---|---|---|
| | | Skills (Skl) | Emotion (Emt) | Participation (Prt) | Performance (Prf) | |
| Valid | 529 | 529 | 529 | 529 | 529 | 529 |
| Missing | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | 3.64 | 4.05 | 4.14 | 3.86 | 3.87 | 3.98 |
| Std. Deviation | 0.78 | 0.70 | 0.72 | 0.77 | 0.79 | 0.65 |
| Descriptive Level | High | High | High | High | High | High |

The result is consistent with the findings of various researches which stated that it is possible to achieve student satisfaction in online learning by positive online teacher learning activities (An et al., 2008; Chen, 2014; Lister, 2014; Tibi, 2015). In online learning, timely and explanatory teacher feedback is also relevant (Britto & Rush, 2013; Sebastianelli et al., 2015; Wallace, 2003); and consistent teacher and virtual student contact (Lister, 2014; Roper, 2007; Uusiautti et al., 2017). Therefore, as Gil (2008) stated, the four most influential categories of online learning satisfaction are management, functionality, teaching, and interaction. In combination, the continuous expansion of online resources is vital for the university to make students' online course learning easy and efficient, taking into account the high level of student satisfaction in online learning. This supports the argument of different authors (Parahoo et al., 2016; Yukselturk & Yildirim, 2008), which indicated that online learning satisfaction of students remains one of the most critical measures of the quality of online learning experiences and is one of the essential elements in assessing the quality of online learning for higher education institutions.

In terms of the overall level of student engagement in online learning amid the COVID-19 pandemic, the data shows that students have a 'high' level of engagement in online learning (M=3.98; SD=0.65). Its domains got mean scores, to wit: 4.05 (SD=0.70) or "high" for skills, 4.14 (SD=0.72) or 'high' for emotion, 3.86 (SD=0.77) or 'high' for participation and 3.87 (SD=0.79) or 'high' for performance. Data implies that in the first term of the semester, the university students have a level of engagement in online learning who keep up with readings and put forth efforts on tasks. They also make the course interesting and consequently apply it to their own lives. Further, students have strong interaction and active participation engagement in online discussions. As to online course performance, students are doing well on tests and get good grades. The result of the study is consistent with the statement by Handelsman et al. (2005), which stressed that students devote time and energy to online learning in terms of skills engagement, emotional engagement, participation engagement, and performance engagement, all of which represent students' high learning engagement. Besides, Dixson (2015) clarified that students could use time and resources to acquire materials and skills through online learning, showing that learning, communicating with others online positively, and being at least somewhat emotionally involved with their learning. Students with a degree of dedication to online learning have constructive attitudes, emotions, and actions and virtual contact with others. They feel good about their learning and their connections with the content, the teacher, and other students in terms of skills, participation, performance, and emotion.

### Significant Difference in the Level of Course Satisfaction and Student Engagement in Online Learning when Analyzed by Gender, Age, Year Level, and Course

The second objective of the study was to determine the significant difference in the level of course satisfaction and student engagement in online learning amid the COVID-19 pandemic in the University of Mindanao – Bansalan College, Philippines. Students' course satisfaction and engagement in online learning were compared in terms of gender, age, year level, and course (see Table 3). The analysis of the data indicates that there was no statistically significant difference in the level of course satisfaction of students from different groups since ANOVA results show p-values of 0.728 (gender), 0.180 (age), 0.428 (year level), and 0.149 (course). Hence, the null hypothesis was accepted. This presupposes that students at the University of Mindanao – Bansalan College have the same course satisfaction level in online learning. They have similar perceptions of the quality of online learning delivery. They experience comparable satisfaction levels in meeting their needs in the online learning environment amid the COVID-19 pandemic, especially in terms of content delivery and teachers' communication and feedback. According to a study of various authors (Anifowoshe et al., 2020; Demuyakor, 2020; Owusu-Fordjour et al., 2020), amid this COVID-19 pandemic, students' feel satisfied with online learning if while studying online from home, they will have the opportunity to ask questions about the lesson contents and expect a timely response from their online teachers. Hence, in the context of academic work, teachers' timely feedback is essential. On the other hand, the data shows that there was no statistically significant difference in the level of student engagement in online learning from different groups since ANOVA results show p-values of 0.751 (gender), 0.874 (age), and 0.478 (course), except for year level (p-value = 0.006 or 'significant'). Results on post hoc comparisons show that the level of engagement in the second year students' online learning is significantly different from the third-year students (p-value=0.003 or 'significant'). This implies that these students from two different year level groups have varying engagement in online learning and online connections with the content, the teacher, and other students in terms of skills, participation, performance, and emotion.

**Table 3.** Test of Difference in the Level of Course Satisfaction and Student Engagement in Online Learning when analyzed by Gender, Age, Year Level and Course

| | Cases | Sum of Squares | df | Mean Square | F | p | Description |
|---|---|---|---|---|---|---|---|
| Course Satisfaction | Gender | 0.388 | 2.000 | 0.194 | 0.318 | 0.728 | NS |
| | Age | 2.983 | 3.000 | 0.994 | 1.637 | 0.180 | NS |
| | Year Level | 1.694 | 3.000 | 0.565 | 0.925 | 0.428 | NS |
| | Course | 3.253 | 3.000 | 1.084 | 1.786 | 0.149 | NS |
| Student Engagement | Gender | 0.242 | 2.000 | 0.121 | 0.287 | 0.751 | NS |
| | Age | 0.295 | 3.000 | 0.098 | 0.232 | 0.874 | NS |
| | Year Level | 5.169 | 3.000 | 1.723 | 4.167 | 0.006 | S |
| | Course | 1.048 | 3.000 | 0.349 | 0.829 | 0.478 | NS |

*Statistical significance at p < 0.001*

*NS=Not Significant; S=Significant*

*Post Hoc Comparisons – Year Level (Second Year vs. Third Year); p=0.003*

## Relationship between Course Satisfaction and Student Engagement in Online Learning

This study's third objective was to determine the significant relationship between course satisfaction and student engagement in online learning amid the COVID-19 pandemic in the University of Mindanao – Bansalan College, Philippines. The results of the normality tests indicate the normal distribution of the data (< .001). Pearson correlation coefficient analysis was performed to explain the relationships between the Crs and SE constructs (Skl, Emt, Prt, and Prf). The results from Table 4 show that in general, when the online course satisfaction was correlated with the online student engagement, it gained a correlation value of 0.336 with p-value of < .001 or 'significant.' When the course satisfaction was correlated with the student engagement domains, results revealed the correlation values and p-values, to wit: skills (r-value=0.333; p-value of < .001 or 'significant'); emotion (r-value=0.322; p-value of < .001 or 'significant'); participation (r-value=0.295; p-value of < .001 or 'significant'); and performance (r-value=0.229; p-value of < .001 or 'significant'). This rejects the null hypothesis. This presupposes that online course satisfaction is a significant factor that influences student engagement in online learning. Students who are satisfied with online activities, tasks, and communications also have a high level of online learning engagement and have augmented online networks and potentials with others in terms of skills, participation, performance, and emotion. As stipulated by Bayrak et al. (2020), universities need to consider student satisfaction in online learning. It is one factor for determining the quality of online pedagogy and affects students' learning engagement online. Students with a high level of online pedagogy satisfaction are more likely to continue to pursue online courses.

**Table 4.** Pearson Correlation Coefficient Analysis on the Relationship between Course Satisfaction and Student Engagement in Online Learning

| Variable | | Crs | SE | Skl | Emt | Prt | Prf |
|---|---|---|---|---|---|---|---|
| 1. Course Satisfaction | Pearson's r | — | | | | | |
| | p-value | — | | | | | |
| 2. Student Engagement | Pearson's r | 0.336 | — | | | | |
| | p-value | < .001 | — | | | | |
| 3. Skills | Pearson's r | 0.333 | 0.887 | — | | | |
| | p-value | < .001 | < .001 | — | | | |
| 4. Emotion | Pearson's r | 0.322 | 0.877 | 0.796 | — | | |
| | p-value | < .001 | < .001 | < .001 | — | | |
| 5. Participation | Pearson's r | 0.295 | 0.885 | 0.686 | 0.702 | — | |
| | p-value | < .001 | < .001 | < .001 | < .001 | — | |
| 6. Performance | Pearson's r | 0.229 | 0.838 | 0.632 | 0.577 | 0.686 | — |
| | p-value | < .001 | < .001 | < .001 | < .001 | < .001 | — |

## Interrelationships among Course Satisfaction (Crs), Skills Engagement (Skl), Emotion Engagement (Emt), Participation Engagement (Prt), and Performance Engagement (Prf)

The technique of SEM was applied to test the hypothesized model that specifies the relations among course satisfaction (Crs), skills engagement (Skl), emotion engagement (Emt), participation engagement (Prt), and performance engagement (Prf). First, the evaluation of model-to data-fit indices showed that the proposed model well explained the data. Among the fit indices, the values of Chi-square = 9.182e-14, degree of freedom = 2, $p < .001$, GFI = 0.95, CFI = 0.96, NFI = 0.96, SRMR = 0.031, RMSEA = < 0.001 indicated a good model fit (Hair et al., 2006; Hu & Bentler, 1999). These fit statistics suggested that the hypothesized model was appropriate for interpreting the structural relationships among Crs, Skl, Emt, Prt, and Prf.

Path analysis was then employed to assess the direct relationships among each variable of the structural model. Figure 1 illustrates the parameter estimates for the structural model. As shown in the figure, 'Course Satisfaction' in online learning was a significant and positive factor predicting students' skills engagement ($\beta = 0.33$, $p < .001$), emotion engagement ($\beta = 0.32$, $p < .001$), participation engagement ($\beta = 0.29$, $p < .001$), and performance engagement ($\beta = 0.23$, $p < .001$). Taken together, course satisfaction played a direct role in student engagement aspects in terms of skills, emotion, participation, and performance in online learning amid the COVID-19 pandemic.

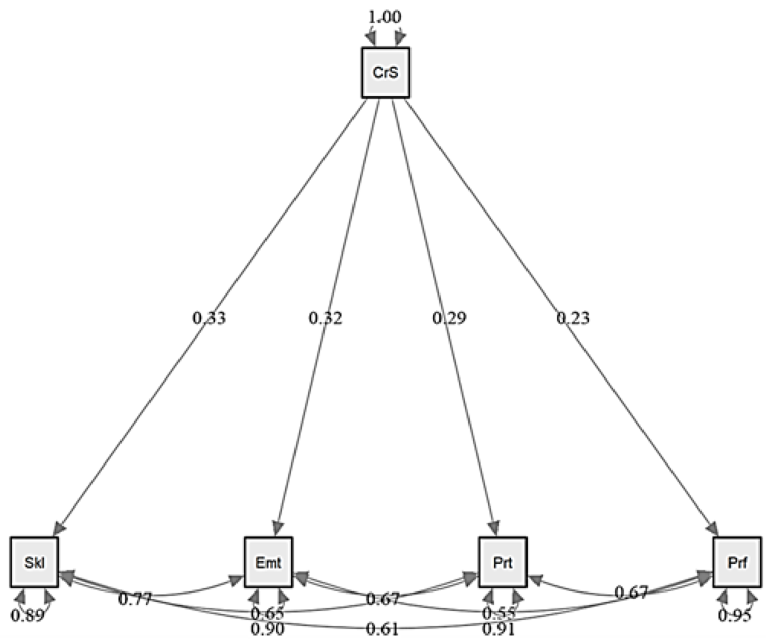


**Figure 1.** The Final Model of the Structural Relations among Crs, Skl, Emt, Prt, and Prf

## CONCLUSION AND RECOMMENDATIONS

The adoption of online learning modality among Higher Education Institutions increased exponentially amid the COVID-19 pandemic. As the universities shifted from onsite learning to online learning, course satisfaction and student engagement became the emerging concern among teachers. As the academic institutions adjust to the new normal pedagogical setting, it is essential to assess online learning delivery quality by determining students' course satisfaction and, consequently, ascertaining how this influences their online learning engagement. In this study, the findings revealed that students are highly satisfied with online learning delivery. Students are highly satisfied that their learning needs are met in the online learning environment amid the COVID-19 pandemic, especially with how teachers establish online communication and provide constant feedback on students' performance online. Online learning contents are also delivered effectively and intelligibly by teachers. The high level of student engagement in online learning was also recorded in this study. Students allocate time and energy in online learning through their high level of skills, positive attitude, interaction, participation, and interactions online. Data also revealed that the students have the same level of satisfaction on the quality of online learning delivery, but have different online learning engagement levels as to year level particularly the second year and third year students. One significant finding of this study was that online course satisfaction was correlated with online student engagement. Students who are satisfied with the learning opportunities provided by teachers online are more likely to be engaged online in terms of course skills, participation, performance, and emotion. Further, through structural equation modeling, it was further specified that online course satisfaction is significantly related with students' skills engagement, emotion engagement, participation engagement, and performance engagement constructs of student engagement in online learning.

Based on the study's findings and conclusion, we recommend that the Higher Education Institutions (HEIs) may improve online learning delivery quality in the new normal setting amid the COVID-19 pandemic. With the rapid transfer from onsite to online learning, it is recommended for teachers to provide learning materials online that help augment student online learning engagement. Teachers may organize course contents and employ online teaching strategies to help students feel emotionally, cognitively, and socially engaged throughout the online learning process. Further, teachers may strengthen communication and feedback practices online. The school administrators may invest time in continuous assessment on the quality delivery of online learning, course satisfaction, and learning engagement and use these assessment results for policymaking and academic management decisions. With the new mode of teaching delivery, adequate and appropriate online resources and materials may be provided to students to assist their online learning needs and consequently develop their knowledge, skills, and performance, and positive attitudes towards learning. Likewise, universities may invest in effective, efficient and easy-to-access Learning Management System (LMS) and other online learning tools. Hence, HEIs may consider the idea that online learning's effectiveness amid this COVID-19 pandemic depends on the satisfactory learning materials and resources, teachers' facilitation and engagement in the online environment, and meaningful teacher-student or student-student interactions.

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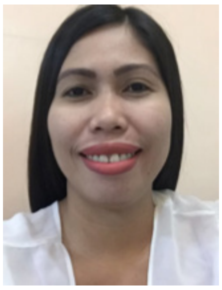

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## REFERENCES


Abbasi, S., Tahera, A., Ayoob, T., & Malik, S. (2020). *Perceptions of students regarding e-learning during COVID-19 at a private medical college*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7306963/pdf/PJMS-36-S57.pdf.

An, H., Kim, S., & Kim, B. (2008). Teacher perspectives on online collaborative learning: Factors perceived as facilitating and impeding successful online group work. *Contemporary Issues in Technology and Teacher Education, 8*(1), 65-83.

Anifowoshe, O., Aborode, A.T., Ayodele, T.I., Iretiayo, A.R., & David, O.O. (2020). Impact of COVID-19 on Education in Sub-Saharan Africa. *Preprints*, 2020070027.

Baloran, E.T. (2020). Knowledge, attitudes, anxiety, and coping strategies of students during COVID-19 pandemic. *Journal of Loss and Trauma, 25*(8), 635-642, DOI: 10.1080/15325024.2020.1769300.

Bali, S., & Liu. M.C. (2018). Students' perceptions toward online learning and face-to-face learning courses. *J Physics*, 1108:012094. doi :10.1088/1742-6596/1108/1/012094.

Basilaia, G. , Dgebuadze, M., Kantaria, M., & Chokhonelidze, G. (2020). Replacing the classic learning form at universities as an immediate response to the COVID-19 virus infection in Georgia. *International Journal for Research in Applied Science & Engineering Technology, 8*(3).

Bayrak, F., Tibi, M., & Altun, A. (2020). Development of online course satisfaction scale. *Turkish Online Journal of Distance Education-TOJDE, 21*(4), 110- 123.

Britto, M., & Rush, S. (2013). Developing and implementing comprehensive student support services for online students. *Journal of Asynchronous Learning Networks, 17*, 29–42.

Carey, K. (2020, March 13). *Everybody ready for the big migration to online college? Actually, no.* Retrieved from https://www.nytimes.com/2020/03/13/upshot/coronavirus-online-college-classes-unprepared.html.

Chen, S. J. (2014). Instructional design strategies for intensive online courses: An objectivist-constructivist blended approach. *Journal of Interactive Online Learning, 13*(1), 72-86.

Demuyakor, J. (2020). Coronavirus (COVID-19) and online learning in higher institutions of education: A survey of the perceptions of Ghanaian international students in China. *Online J. Commun. Media Technol., 10*, e202018.

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems, 49*(1) 5–22.

Dixson, M. (2015). Measuring Student Engagement in the Online Course: The Online Student Engagement Scale (OSE). *Online Learning, 19*(4).

Favale, T., Soro, F., Trevisan, M., Drago, I., & Mellia, M. (2020). Campus traffic and eLearning during COVID-19 pandemic. *Computer Networks, 176*, 107290.

Gil, H. (2008). The challenge of the transition from online delivery to online teaching and learning. In K. McFerrin, R. Weber, R. Carlsen, D. A. Williset. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference*. Chesapeake, VA: AACE, 2589-2594.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis (6th ed.)*. New York, NY: Prentice Hall.

Handelsman, M. M., Briggs, W. L., Sullivan, N., & Towler, A. (2005). A measure of college student course engagement. *The Journal of Educational Research, 93*(3), 184–191.

Hu, L.T., & Bentler, M. P. (1999). Cutoff criteria in fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55.

Hu, M., & Li, H. (2017). Student engagement in online learning: A review. *International Symposium on Educational Technology (ISET)*, Hong Kong, 2017, pp. 39-43, doi: 10.1109/ISET.2017.17.

Li, C., & Lalani, F. (2020, April 29). T*he COVID-19 pandemic has changed education forever. This is how*. Retrieved from https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/.

Lisha, L., & Zhang, Q. (2003). The types and characteristics of online learning. *Education Science, 1*, 49-52.

Lister, M. (2014). Trends in the design of e-learning and online learning. *Journal of Online Learning and Teaching, 10*(4), 671-680.

Littlefield, J. (2018). *The difference between synchronous and asynchronous distance learning*. Retrieved from https://www.thoughtco.com/synchronous-distance-learning-asynchronous-distance-learning-1097959.

Mamattah, R.S. (2016). *Students' perceptions of e-Learning*. Retrieved from https://www.diva-portal.org/smash/ get/diva2:925978/FULLTEXT01.pdf.

McBrien, J. L., Cheng, R., & Jones, P. (2009). Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *The International Review of Research in Open and Distributed Learning, 10*(3), 1–17.

Owusu-Fordjour, C., Koomson, C.K., & Hanson, D. (2020). The impact of COVID-19 on learning—The perspective of the Ghanaian student. *Eur. J. Educ. Stud., 7*, 1–14.

Parahoo, S. K., Santally, M. I., Rajabalee, Y., & Harvey, H. L. (2016). Designing a predictive model of student satisfaction in online learning. *Journal of Marketing for Higher Education, 26*(1), 1-19. Doi: https://doi.org/10.1080/08841241.2015.1083511

Qureshi, I.A., Ilyas, K., Yasmin, R., & Whitty, M. (2012). Challenges of implementing e-learning in a Pakistani university. *Know Manag E-Learn, 4* (3). doi: 10.34105/j.kmel.2012.04.025.

Roper, A. R. (2007). How students develop online learning skills. *Educause Quarterly, 30*(1), 62-65.

Sebastianelli, R., Swift, C., & Tamimi, N. (2015). Factors affecting perceived learning, satisfaction, and quality in the online MBA: A structural equation modeling approach. *Journal of Education for Business, 90*(6), 296–305. Doi: https://doi.org/10.1080/08832323.2015.1038979.

Singh, A., & Min, A.K. (2017). Digital lectures for learning gross anatomy: a study of their efficacy. *Korean J Med Educ., 29*, 27-32. doi: 10.3946/kjme.2017.50.

Singh, V., & Thurman, A. (2019). How many ways can we define online learning? A systematic literature review of definitions of online learning (1988-2018). *American Journal of Distance Education, 33*(4), 289–306.

Talidong, K. J. B., & Toquero, C. M. D. (2020). Philippine teachers' practices to deal with anxiety amid COVID-19. *Journal of Loss and Trauma*. Advance online publication. https://doi.org/10.1080/15325024.2020.1759225.

Tibi, M. H. (2015). Improving collaborative skills by computer science students through structured discussion forums. *Journal of Technologies in Education, 10* (3-4), 27-41. doi:10.24059/olj.v22i1.995.

Uusiautti, S., Maatta, K., & Leskisenoja, E. (2017). Succeeding Alone and Together-University Students' Perceptions of Caring Online Teaching. *Journal of Studies in Education, 7*(2), 48-66. doi: https://doi.org/10.5296/jse.v7i2.11162

Wallace, R. M. (2003). Online learning in higher education: A review of research on interactions among teachers and students. *Education, Communication, and Information, 3*(2), 241-280. doi: https://doi.org/10.1080/14636310303143.

Yukselturk, E., & Yildirim, Z. (2008). Investigation of interaction, online support, course structure and flexibility as the contributing factors to students' satisfaction in an online certificate program. *Educational Technology & Society, 11*(4), 51-65.

# ACADEMIC PROCRASTINATION AND PERFORMANCE IN DISTANCE EDUCATION: A CAUSAL-COMPARATIVE STUDY IN AN ONLINE LEARNING ENVIRONMENT

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## ABSTRACT

Research indicates that academic procrastination is a common attitude among learners, and that it generally has a negative correlation with academic performance. The present quantitative causal-comparative study aims to determine the cause of differences, in terms of procrastination tendency, in academic performance among online learners. The study further investigates whether academic procrastination tendency significantly predicts the academic performance of online learners. The sample included a total of 333 online distance learners, from whom data were obtained through an online survey. Results showed that there was no statistically significant difference between male and female learners in terms of academic procrastination. Moreover, low procrastinators had better academic performance than that of high procrastinators, and learners' academic procrastination tendencies significantly predicted academic performance. These results demonstrate that academic procrastination tendency is an important indicator for predicting the academic achievements of online learners.

**Keywords:** Procrastination, academic performance, online learning, distance education, online learning environment.

## INTRODUCTION

Online distance learning (ODL) has been gaining popularity, functioning now as a mainstream mode of education in current education systems on account of the limitations it eliminates for learners, instructors, and learning resources. However, despite the flexible learning opportunities and other advantages offered by ODL to learners, high dropout rates, low retention, academic performance problems, and academic procrastination issues continue to be very common in ODL (Cerezo, Esteban, Sánchez-Santillán, & Nunez, 2017; Elvers, Polzella, & Graetz, 2003; Hooshyar, Pedaste, & Yang, 2020; Michinov, Brunot, Le Bohec, Juhel, & Delaval, 2011; Wilkinson & Sherman, 1991), due primarily to the fact that the educational delivery mode places almost all the learning and performance responsibility on learners. In ODL systems, learners are assumed to be self-regulated and capable of organizing and controlling their learning process, meaning that online learners should be motivated and self-regulated to fully benefit from the advantages offered by ODL. Therefore, in the context of ODL environments, online students need to be supported in terms of the self-regulation and motivation practices necessary for becoming independent learners – the truly autonomous student does not exist *per se*. As indicated from the theory and practice of distance education, student support services and scaffolding have always played a central role in open and distance education systems: "Distance learning can be very isolating, and inadequate attention to course design, student counselling and support can yield poor completion rates and the worst aspects of one-way knowledge transmission" (Brindley & Paul, 1996, p. 43). The characteristics of distance learners are quite different from those seen on the traditional student profile (Stoter, Bullen, Zawacki-Richter, & von Prummer, 2014; Thompson, 1996). The majority of the student population in ODL are working adults, whose lives require them to balance professional, private and social demands. By its very nature, ODL requires students to have more self-regulation skills. In this context, it can be said that online distance learners in unstructured learning environments are more prone to procrastination behavior (Deimann, & Bastiaens, 2010; Klingsieck, Fries, Horz, & Hofer, 2012; Ucar & Bozkurt, 2018). For example, Tuckman (2005) found that lack of control and student self-control in distance learning environments led to excessive procrastination and poor performance, especially among procrastination prone learners. There are therefore many occasions that prevent students from learning or that cause them to postpone learning. Against this background, research on the topic of procrastination in distance learning is of particular importance. Thus, the purpose of this paper is to explore the procrastination behavior of non-traditional distance learning students in order to provide important information on the design of academic student support services at distance teaching institutions.

## LITERATURE REVIEW

Procrastination can be considered a failure of self-regulation (Grund & Fries, 2018; Grunschel, Patrzek, Klingsieck, & Fries, 2018; Steel & Klingsieck, 2016; Ucar & Bozkurt, 2019; Uzun, Ferrari, & LeBlanc, 2018). Steel (2007) defines procrastination as a "voluntary delay on intended course of action despite expecting to be worse off for the delay." (p. 66). Following Steel's (2007) definition, Klingsieck (2013) expanded the idea of procrastination and redefined it as "the voluntary delay of an intended and necessary and/or personally important activity, despite expecting potential negative consequences that outweigh the positive consequences of the delay." (p. 26). Steel and Klingsieck (2016) defined academic procrastination as "procrastination restricted to the tasks and activities related to and/or relevant for learning and studying." (p. 37).

A meta-analysis study conducted by Steel (2007) on procrastination revealed that 80% to 95% of the university students engaged in procrastination behavior. Moreover, 75% of these students viewed themselves as procrastinators, and most interesting of all, about 50% of these students said that they procrastinate all the time. From other studies conducted on this subject, including those by Fernie, Bharucha, Nikcevic, Marino, and Spada (2017), Sutcliffe, Sedley, Hunt, and Macaskill (2019), Ko and Chang (2019) and Steel (2007), it was recognized that academic procrastination is a common, albeit unfavorable behavior among learners, and that effort is needed to decrease the impact of this behavior.

Academic procrastination poses a major obstacle to the academic achievement of students (Asikhia, 2010; Steel & Klingsieck, 2016). It is reported that there is a negative correlation between procrastination tendency and academic performance (Grunschel, Schwinger, Steinmayr, & Fries, 2016; Hen & Goroshit, 2018; Kim & Seo, 2013, 2015). That is, high academic procrastination tendency is associated with low academic performance. According to Fernie et al. (2017), procrastination is a negative behavior, influencing students' academic performance negatively as well as lowering their effectiveness in their field of employment after the completion of their schooling. However, it is important to note that although Fernie et al. (2017) view procrastination as a negative behavior, most of academic procrastination was shown to be intentional and learners were very aware of that they engaged in this type of behavior. Alp and Sungur (2017) report that procrastination is substantially connected to academic achievement and therefore is a hot topic for educators. In line with these notions, academic procrastination is also significantly linked to goal accomplishment, that is, academic performance (Cormack, Eagle, & Davies, 2020; Gustavson & Miyake, 2017).

A majority of the research conducted on general procrastination and academic procrastination has been performed in face to face learning environments. As such, most of the research findings are related strictly to the face-to-face mode of learning. Only a limited amount of the research on academic procrastination has been conducted in distance education environments, and so the related literature on ODL has provided but a weak bulk of studies. For example, in an experimental study conducted by Elvers, Polzella, and Graetz (2003) comparing face-to-face and online learners in terms of their procrastination tendencies, the findings showed that online learners had low procrastination tendencies and better academic success than that of face-to-face learners. The researchers also highlighted that while procrastination tendency was an important indicator that could be used to predict online learners' performance, it was not a good indicator of performance for face-to-face learners. Another research study conducted by Cerezo et al. (2017) with 140 undergraduate students who were participating in an online course given through a learning management system (LMS) reported similar findings. In line with the above studies, Michinov et al. (2011) conducted research with 53 learners enrolled in an online learning program and reported that low procrastinators had better academic success than that of high procrastinators in online learning. However, the samples used in these three studies were relatively small. Thus, more research is needed to get a broader understanding of academic procrastination and its effects in online learning environments. Taking this into account, this study was conducted for the dual purpose of providing greater insight and expanding the body of research on procrastination in ODL.

### The Current Study

As understood from the related literature, it is important to know the procrastination behaviors of the learners in ODL in order to take the necessary precautions in addressing academic procrastination tendency, as it is significantly related to course performance and accomplishment. Thus, this study aims to examine the possible differences in academic performance between online learners with high and low procrastination tendencies. In this context, the following research questions were developed:

1. Do male and female learners significantly differ in their level of procrastination tendencies?

*Research hypothesis 1*: Online male and female learners will score the same on academic procrastination.

2. Do procrastination tendency differences produce differences in the academic performance of online learners?

*Research hypothesis 2*: Online learners who scored lower on academic procrastination tendency will have better academic performance than that of those who scored higher on academic procrastination tendency.

**3.** Does academic procrastination tendency predict the academic performance of online learners?

*Research hypothesis 3*: The academic procrastination tendency of online learners will predict their academic performance.

## METHODOLOGY

### Research Design

This research aims to explore the effects of the academic procrastination tendencies of online learners in an online learning environment, and to determine the cause of the differences in academic performance that already exist among online learners. To these ends, the research applied a quantitative causal-comparative design (Fraenkel & Wallen, 2012; Schenker & Rumrill, 2004), in order to best determine "the cause and consequences of differences that already exist between or among groups of individuals" (Fraenkel & Wallen, 2012, p. 363).

## Participants

A total of 333 online undergraduate learners taking an online English course at a state university in Turkey participated in the study. While they took this course fully online, they were also attending face to face courses and the programs they enrolled were offering face to face courses. The participants ranged in age between 18 and 23 ($M_{age}$=20.06 years), and 205 were female (61.6%) and 128 were male (38.4%). All participants voluntarily agreed to participate in the study via an informed consent form that was embedded in the online survey.

## Procedure

The data were collected through an online survey administered in the 2018-2019 spring term. The researchers sent a message about the survey to nearly 1,200 learners through the learner information system (LIS) and LMS. Of these learners, 680 viewed the survey, 444 started the survey, and 350 completed the survey, which means, approximately 51.5% of the learners who viewed the survey completed it. Of these completed surveys, a total of 12 were omitted because of incomplete items and repeated answers. As a result, the final data was collected from 333 survey respondents.

## Measures

The online learners' academic procrastination tendencies were measured using the *Turkish version of the Tuckman Procrastination Scale.* This scale was translated and developed by Uzun Ozer, Sackes, and Tuckman (2013) from *The Tuckman Procrastination Scale* (Tuckman, 1991), a widely used, 14-item scale to measure the academic procrastination tendency of learners. The instrument is arranged as a four-point Likert-type scale (1-strongly disagree, 4-strongly agree) and has a single factor structure (Uzun Ozer, Sackes, & Tuckman, 2013). The following is a sample item on the scale: "I needlessly delay finishing jobs, even when they're important." For the original scale administered to two different samples of undergraduate students, the Cronbach's alpha reliability coefficient was reported as 0.90 and 0.85. In the current study, the Cronbach's alpha reliability coefficient of the scale was calculated as 0.65, which is considered acceptable. Regarding the academic procrastination, a median split method was used to categorize the learners. With this method, the learners were labeled as low (22-34) and high (35-51) procrastinators, according to their total points on the procrastination scale. Grade point average was used to assess the academic performance of the learners. During the 14-week term, learners took three exams related to the course. The grade point average scores were calculated as follows: 10% of the score was based on the online quiz scores, 40% of the score was based on the mid-term exam, and 50% of the score was based on the final exam in the course.

## Data Analysis

The data collected in this study were analyzed in terms of the procrastination tendency and academic performance. Independent samples t-test was employed to compare the means of the male and female learners' level of procrastination tendencies (research question 1) and to compare low and high procrastinators, in order to designate whether there was a statistical difference in their academic performance scores (research question 2). Finally, a simple linear regression model was used to predict the relationship between academic procrastination tendency and academic performance (research question 3).

# RESULTS

The purpose of this study was to explore whether male and female learners in ODL would have different academic procrastination tendencies. In addition, the study examined whether different procrastination scores produced differences in academic performance. In this regard, the study explored whether academic procrastination tendency was able to predict the academic performance of online learners. The results related to the research questions are given below.

In order to answer research question 1, the independent samples t-test was used to compare the male and female learners' means on the academic procrastination scale. The results of the test showed that although the female learners' average mean score (M=34.8, SD=4.1) was slightly higher than the male learners' average mean score (M=34.1, SD=5.2), the difference was not statistically significant ($t_{(331)} = 1.18$, $p = 0.23$) in terms of academic procrastination. Thus, the result confirmed research hypothesis 1.

To answer research question 2, the independent samples t-test was used to compare low and high academic procrastinators' means on academic performance scores. On average, low procrastinators had better academic performance (M = 54.76, SD = 10.6, SE = 0.83) than that of high procrastinators (M = 49.65, SD = 10.5, SE = 0.81). This difference was significant ($t_{(331)} = 4.38$, $p < 0.01$), and it had close to a medium-sized effect ($d = 0.48$). Thus, the result confirmed research hypothesis 2.

To answer research question 3, a simple linear regression model was used to predict the relationship between academic procrastination tendency and academic performance. Simple linear regression was used to assess whether learners' academic procrastination tendencies significantly predicted academic performance. The result of the regression suggested that learners' academic procrastination tendencies explained 0.2% of the variance, (R2 = 0.023; F(1,131) = 7.808, p < 0.05) (Table 1 and 2). In other words, the learners' academic procrastination tendencies significantly predicted academic performance ($B = -0.35$, $t = -2.79$, $p < 0.05$) (Table 3), thus confirming hypothesis 3.

**Table 1.** Summary of the regression model

| Model | R | $R^2$ | Adj. $R^2$ | SEM | *Change Statistics* | | |
|---|---|---|---|---|---|---|---|
| | | | | | $R^2$ | *F* | *P* |
| 1 | 0.152[a] | 0.023 | 0.020 | 10.78 | 0.023 | 7.80 | 0.006 |

a. Predictors: (Constant), academic procrastination tendency

**Table 2.** Summary of Analysis of Variance results

| | Model | SS | df | MS | F | *P* |
|---|---|---|---|---|---|---|
| 1 | Regression | 908.741 | 1 | 908.74 | 7.80 | 0.006[b] |
| | Residual | 38523.13 | 331 | 116.38 | | |
| | Total | 39431.88 | 332 | | | |

a. Dependent Variable: academic performance, b. Predictors: (Constant), academic procrastination tendency

**Table 3.** Coefficients

| Model | | Unstandardized | | | | |
|---|---|---|---|---|---|---|
| | | B | SE | β | t | *P* |
| 1 | (Constant) | 64.559 | 4.478 | | 14.418 | 0.000 |
| | procrastination | -.359 | 0.128 | -.152 | -2.794 | 0.006 |

a. Dependent Variable: academic performance

## DISCUSSION

The present study aimed to examine possible differences related to academic performance and gender between online learners with high and low procrastination tendency. The research findings indicated that there was no significant difference between male and female online learners in terms of academic procrastination, which means that academic procrastination is a gender-free issue. This result is consistent with previous work conducted on this subject by Hess, Sherman, and Goodman (2000), Uzun Ozer and Ferrari (2011), and Watson (2001), all of whom investigated gender role differences in academic procrastination in face-to-face educational settings. However, in a different study by Steel (2007), contradictory findings were reported. Accordingly, in his meta-analytic study on research investigating possible causes and effects of procrastination, it was reported that male learners procrastinate slightly more than female learners.

Previous studies researching procrastination among face to face undergraduate students reached similar findings, showing that male learners' procrastination tendency is significantly higher than that of females (Fernie et al., 2017; Uzun Ozer, Demir, & Ferrari, 2009; Uzun Ozer, 2014; Yockey, 2016). This finding is also supported by Steel and Ferrari's (2013) study which surveyed 16413 adults and found that procrastination was strongly associated with gender. Another study conducted by Baltaci (2017) with primary school teachers also reported the same findings. The different research findings suggest that procrastination, in terms of gender, can be affected by a wide array of variables, including subject area, delivery modes of educational content, digital literacies of distance education learners, and socio-economic status of learners (e.g., employment status, social roles). In the context of distance education, most of the open universities deliver educational content to a massive number of students. For instance, at Anadolu University, a giga university with 3 million enrolled learners, the age range of students is 18 to 68 and they come from diverse socioeconomic backgrounds (Bozkurt, 2019). Considering that the age span and socio-economic status of the learners in the present study were narrower in range (e.g., from 18 to 23, undergraduate young learners), a different age span may lead to different research findings. This finding further implies that future research should consider different demographics to better examine and gain more insight into the academic procrastination phenomenon.

Another result from the present study, albeit it represented a medium-sized effect, was that low procrastinators had better academic performance. This finding is in line with previous studies conducted in online learning environments showing that low procrastinators have better academic success than that of high procrastinators (Cerezo et al., 2017; Michinov et al., 2011). Grunschel et al. (2016) conducted two studies with campus-based undergraduate students and reported a similar finding. Consistent with these findings, Kim and Seo (2015), carried out a meta-analysis study and found there to be a negative correlation between procrastination and academic performance. Thus, in general, learners with low achievement have high procrastination tendencies. The present research provides additional data on the relationship between academic performance and procrastination and contributes to the limited research corpus on this issue in online distance learning. However, it should be further taken into account that learners' self-regulation skills matter in distance education; therefore, additional studies could examine the relationship between self-regulation and academic procrastination.

Regarding the third research question, the present study found that online learners' academic procrastination tendencies significantly predicted academic performance. This finding is consistent with the findings reported in the studies by Elvers, Polzella, and Graetz (2003) and Hooshyar, Pedaste, and Yang's (2020), which revealed that learners' performance can be predicted successfully through learners' procrastination tendencies in online distance learning. In addition, Elvers, Polzella, and Graetz (2003) indicated that procrastination was a good predictor of performance "for the online students", but not a good predictor of performance "for the lecture students" (p.162). However, in the study by Cormack, Eagle, and Davies (2020), although a significant negative relationship was found between these two variables, the researchers stated that procrastination was not a strong factor associated with academic performance within the context of the study. Many of the studies found in the related literature (e.g., Grund & Fries, 2018; Gustavson & Miyake, 2017; Kim & Seo, 2013, 2015; Wäschle, Allgaier, Lachner, Fink, & Nuckles, 2014) also confirm the finding of the current study. In contrast, Seo (2011) and Schraw, Wadkins, and Olafson (2007) report contradictory results, finding no significant relationship between learners' procrastination tendencies and their course achievement. Although new studies have revealed there to be a significant negative relationship between procrastination tendency and academic achievement, further research is still needed in the field of online distance education.

## Limitations and Future Research

Although this study collected substantial findings on academic procrastination, there are some limitations that must be acknowledged. The participants of the study were undergraduates who were taking courses online as well as face-to-face courses. Therefore, these participants cannot be considered as fully online distance learners. To this end, future studies should be conducted with fully online distance learners to compare the findings presented in the current study. Another limitation was the research design of the study. Since independent variables are not manipulated in causal-comparative research designs, internal validity cannot be assured. On this account, the researchers are not sure whether changes in the dependent variables were caused by the independent variables. Future studies should be carried out using experimental research designs to eliminate this limitation. The sample size can also be partially counted as a limitation. Future studies should consider larger samples in the online distance education context to compare the findings presented in this study. In addition, qualitative studies that include physiological dimensions are needed to understand the root causes of academic procrastination in online learning environments. Additionally, future research examining variables like marital status, employment, age-range, or study conditions of online distance learners will further explain procrastination issue in ODL settings.

## CONCLUSION

This study focused on the academic procrastination tendency and performance of online learners. The results of the study showed that low procrastinators had better academic performance than high procrastinators in the online learning environment. Moreover, it was found that online distance learners' academic procrastination tendencies significantly predicted their academic performance. In addition, no significant difference was found between male and female online learners in terms of academic procrastination. In brief, similar to the results reported in previous studies, the findings from this study indicate that academic procrastination has a notable effect on academic performance. To better understand online learners' academic procrastination tendencies, instructional designers or instructors would be able to design motivational strategies or activities that reduce academic procrastination for online distance learners. Early warning systems could be designed to detect at risk students based on their procrastination behavior patterns. Besides, future studies focusing on the internal motives (e.g., motivation, anxiety, etc.), skills and competencies (e.g., digital literacy) can contribute to the related literature to better understand the phenomenon.

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## REFERENCES

Alp, A., & Sungur, S. (2017). Investigating relationships between undergraduate students' flow experience, academic procrastination behavior, and calculus course achievement. *Eurasian Journal of Educational Research, 17*(72), 1-22. https://doi.org/10.14689/ejer.2017.72.1

Asikhia, O. A. (2010). Academic procrastination in mathematics: causes, dangers and implications of counselling for effective learning. *International Education Studies, 3*(3). https://doi.org/10.5539/ies.v3n3p205

Baltaci, A. (2017). Sinif oğretmenlerinin erteleme davranişi eğilimleri ve kişilik ozellikleri arasindaki ilişkiler. *OPUS Uluslararasi Toplum Araştirmalari Dergisi, 7*(12), 54-81.

Bozkurt, A. (2019). The Historical Development and Adaptation of Open Universities in Turkish Context: Case of Anadolu University as a Giga University. *The International Review of Research in Open and Distributed Learning, 20*(4). https://doi.org/10.19173/irrodl.v20i4.4086

Brindley, J. E., & Paul, R. (1996). Lessons from distance education for the university of the future. In R. Mills & A. Tait (Eds.), *Supporting the learner in open and distance learning* (pp. 43–55). Pitman Publishing.

Cerezo, R., Esteban, M., Sánchez-Santillán, M., & Nunez, J. C. (2017). Procrastinating behavior in computer-based learning environments to predict performance: A case study in Moodle. *Frontiers in psychology*, 8, 1403. https://doi.org/10.3389/fpsyg.2017.01403

Cormack, S. H., Eagle, L. A., & Davies, M. S. (2020). A large-scale test of the relationship between procrastination and performance using learning analytics. *Assessment & Evaluation in Higher Education*, 1–14. https://doi.org/10.1080/02602938.2019.1705244

Deimann, M., & Bastiaens, T. (2010). The role of volition in distance education: An exploration of its capacities. *The International Review of Research in Open and Distributed Learning, 11*(1), 1-16. https://doi.org/10.19173/irrodl.v11i1.778

Elvers, G. C., Polzella, D. J., & Graetz, K. (2003). Procrastination in online courses: Performance and attitudinal differences. *Teaching of Psychology, 30*(2), 159-162. https://doi.org/10.1207/s15328023top3002_13

Fernie, B. A., Bharucha, Z., Nikcevic, A. V., Marino, C., & Spada, M. M. (2017). A Metacognitive model of procrastination. *Journal of Affective Disorders, 210*, 196–203. https://doi.org/10.1016/j.jad.2016.12.042

Fraenkel, J. R. & Wallen, N. E. (2012). *How to design and evaluate research in education* (7th ed.). New York: McGraw-Hill.

Grund, A., & Fries, S. (2018). Understanding procrastination: A motivational approach. *Personality and Individual Differences,* 121, 120–130. https://doi.org/10.1016/j.paid.2017.09.035

Grunschel, C., Patrzek, J., Klingsieck, K. B., & Fries, S. (2018). "I'll stop procrastinating now!" Fostering specific processes of self-regulated learning to reduce academic procrastination. *Journal of Prevention & Intervention in the Community, 46*(2), 143–157. https://doi.org/10.1080/10852352.2016.1198166

Grunschel, C., Schwinger, M., Steinmayr, R., & Fries, S. (2016). Effects of using motivational regulation strategies on students' academic procrastination, academic performance, and well-being. *Learning and Individual Differences, 49*, 162–170. https://doi.org/10.1016/j.lindif.2016.06.008

Gustavson, D. E., & Miyake, A. (2017). Academic procrastination and goal accomplishment: A combined experimental and individual differences investigation. *Learning and Individual Differences, 54*, 160–172. https://doi.org/10.1016/j.lindif.2017.01.010

Hen, M., & Goroshit, M. (2018). The effects of decisional and academic procrastination on students' feelings toward academic procrastination. *Current Psychology.* 1-8. https://doi.org/10.1007/s12144-017-9777-3

Hess, B., Sherman, M. F., & Goodman, M. (2000). Eveningness predicts academic procrastination: The mediating role of neuroticism. *Journal of Social Behavior and Personality, 15*(5), 61-74.

Hooshyar, D., Pedaste, M., & Yang, Y. (2020). Mining Educational Data to Predict Students' Performance through Procrastination Behavior. *Entropy, 22*(1), 12. https://doi.org/10.3390/e22010012

Kim, E., & Seo, E. H. (2013). The Relationship of Flow and Self-Regulated Learning to Active Procrastination. *Social Behavior and Personality: An International Journal, 41*(7), 1099–1113. https://doi.org/10.2224/sbp.2013.41.7.1099

Kim, K. R., & Seo, E. H. (2015). The relationship between procrastination and academic performance: A meta-analysis. *Personality and Individual Differences, 82*, 26–33. https://doi.org/10.1016/j.paid.2015.02.038

Klingsieck, K. B. (2013). Procrastination: When good things don't come to those who wait. *European Psychologist, 18*(1), 24–34. https://doi.org/10.1027/1016-9040/a000138

Klingsieck, K. B., Fries, S., Horz, C., & Hofer, M. (2012). Procrastination in a distance university setting. *Distance Education, 33*(3), 295-310. https://doi.org/10.1080/01587919.2012.723165

Ko, C. Y. A., & Chang, Y. (2019). Investigating the relationships among resilience, social anxiety, and procrastination in a sample of college students. *Psychological Reports, 122*(1), 231-245. https://doi.org/10.1177/0033294118755111

Michinov, N., Brunot, S., Le Bohec, O., Juhel, J., & Delaval, M. (2011). Procrastination, participation, and performance in online learning environments. *Computers & Education, 56*(1), 243-252. https://doi.org/10.1016/j.compedu.2010.07.025

Schenker, J. D., & Rumrill Jr, P. D. (2004). Causal-comparative research designs. *Journal of vocational rehabilitation*, *21*(3), 117-121. https://content.iospress.com/articles/journal-of-vocational-rehabilitation/jvr00260

Schraw, G., Wadkins, T., & Olafson, L. (2007). Doing the things we do: A grounded theory of academic procrastination. *Journal of Educational Psychology, 99*(1), 12–25. https://doi.org/10.1037/0022-0663.99.1.12

Seo, E. H. (2011). The relationships among procrastination, flow, and academic achievement. *Social Behavior and Personality: an international journal, 39*(2), 209-217. https://doi.org/10.2224/sbp.2011.39.2.209

Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin, 133*(1), 65–94. https://doi.org/10.1037/0033-2909.133.1.65

Steel, P., & Ferrari, J. (2013). Sex, education and procrastination: An epidemiological study of procrastinators' characteristics from a global sample. *European Journal of Personality, 27*(1), 51-58. https://doi.org/10.1002/per.1851

Steel, P., & Klingsieck, K. B. (2016). Academic Procrastination: Psychological Antecedents Revisited. *Australian Psychologist, 51*(1), 36–46. https://doi.org/10.1111/ap.12173

Stoter, J., Bullen, M., Zawacki-Richter, O., & von Prummer, C. (2014). From the back door into the mainstream – the characteristics of lifelong learners. In O. Zawacki-Richter & T. Anderson (Eds.), *Online distance education—Towards a research agenda* (pp. 421–457). Athabasca University Press.

Sutcliffe, K. R., Sedley, B., Hunt, M. J., & Macaskill, A. C. (2019). Relationships among academic procrastination, psychological flexibility, and delay discounting. *Behavior Analysis: Research and Practice, 19*(4), 315. http://dx.doi.org/10.1037/bar0000145

Thompson, M. M. (1998). Distance learners in higher education. In C. C. Gibson (Ed.), *Distance learners in higher education* (pp. 9–24). Atwood Publishing.

Tuckman, B. W. (1991). The development and concurrent validity of the Procrastination Scale. *Educational and Psychological Measurement*, *51*, 473 – 480. https://doi.org/10.1177/0013164491512022

Ucar, H., & Bozkurt, A. (2019). Using motivation, volition, and performance model to overcome online procrastination. In T. Erdoğan, & S. Ozer. (Eds), *Current Academic Studies in Social Sciences* (pp. 105-112). Cetinje-Montenegro; IVPE.

Ucar, H., & Bozkurt, A. (2018). Uzaktan eğitimde akademik erteleme davranişinin ustesinden gelmek icin motivasyon, eylem ve başari modelinin kullanimi. 5th International Symposium On Multidisciplinary Studies (ISMS) (p. 1210). 16-17 December, Ankara, Turkey.

Uzun Ozer, B. (2014). Psychometric properties of adult inventory of procrastination in a Turkish sample. *Journal of Adult Development, 21*(1), 43-47. https://doi.org/10.1007/s10804-013-9177-3

Uzun Ozer, B., & Ferrari, J. R. (2011). Gender orientation and academic procrastination: Exploring Turkish high school students. *Individual Differences Research, 9*(1), 33-40.

Uzun Ozer, B., Demir, A., & Ferrari, J. R. (2009). Exploring academic procrastination among Turkish students: Possible gender differences in prevalence and reasons. *The Journal of social psychology, 149*(2), 241-257. https://doi.org/10.3200/socp.149.2.241-257

Uzun Ozer, B., Sackes, M., & Tuckman, B. W. (2013). Psychometric properties of the Tuckman Procrastination Scale in a Turkish sample. *Psychological Reports*, *113*(3), 874-884. https://doi.org/10.2466/03.20.pr0.113x28z7

Uzun, B., Ferrari, J. R., & LeBlanc, S. (2018). Put Aside Procrastination: Positive Emotional Outcomes from Self-Forgiveness for Delays. *North American Journal of Psychology, 20*(1). 171-186.

Wäschle, K., Allgaier, A., Lachner, A., Fink, S., & Nuckles, M. (2014). Procrastination and self-efficacy: Tracing vicious and virtuous circles in self-regulated learning. Learning and Instruction, 29, 103–114. https://doi.org/10.1016/j.learninstruc.2013.09.005

Watson, D. C. (2001). Procrastination and the five-factor model: A facet level analysis. *Personality and individual differences, 30*(1), 149-158. https://doi.org/10.1016/s0191-8869(00)00019-2

Wilkinson, T., & Sherman, T. (1991). Procrastination in distance education: a review of what we know and need to learn. *Open Learning: The Journal of Open, Distance and e-Learning, 6*(3), 32–38. https://doi.org/10.1080/0268051910060305

Yockey, R. D. (2016). Validation of the short form of the academic procrastination scale. *Psychological Reports, 118*(1), 171-179. https://doi.org/10.1177/0033294115626825

# AN OPEN ONLINE COURSE TO ENHANCE DIGITAL COMPETENCES OF TEACHERS

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## ABSTRACT

The purpose of this study was to design an online professional development program and evaluate the developed course in light of the implementation results. This course provided teachers with the opportunity to develop an ICT-enhanced lesson plan and apply it in their own classes. The current study was conducted using design-based research. Of the 171 teachers registered, 47 participated and 36 completed the full course and received certificates. The self-assessment of the 36 teachers on their ICT-enhanced classroom practices were used in the evaluation of the course. Second, teacher opinions were also solicited via the Teachers' End-of-course Evaluation Questionnaire. Third, the course was evaluated using a rubric by the instructors. According to the results, the self-assessments of teachers on ICT-integration were high. The satisfaction of the teachers with the open online course was also very high, with 97% recommending the course. The course was evaluated as "exemplary" in terms of Learner Support & Resources, Online Organization & Design, and Instructional Design & Delivery categories, and as "effective" in the rubric's Assessment & Evaluation of Student Learning, Innovative Teaching with Technology, and Faculty Use of Student Feedback categories. Future implementations could be revised by increasing interaction and feedback and providing additional implementation opportunities for the teachers.

**Keywords:** ICT competencies, open online course, professional development, ICT integration, ICT-enhanced lesson plan, teachers' professional development, online course evaluation.

## INTRODUCTION

Individuals in our emerging knowledge society must have literacy in information and communications technology (ICT), which must be acquired through quality education and teachers equipped to provide technology integration (Gao, Tan, Wang, Wong & Choy, 2011). In the classroom, technology integration can be defined as the regular use of information and communications technology (ICT) to improve learning. Teachers and their professional development are key elements in this highly complex integration process (Evans, 2006; Herzig, 2004; Hew & Brush, 2007; Kaya & Usluel, 2011; Pierson, 2001; Usluel, Mumcu, & Demiraslan, 2007). Studies have shown that teacher qualifications are one of the most important indicators of the quality and efficiency of education (Ayaz, Oral, & Soylemez, 2015). Accordingly, teacher competencies and the identification of the qualifications instructors require has become an important area of focus for educational organizations.

The International Society for Technology in Education (ISTE) (2008) identified 20 performance indicators for effective usage of educational technology grouped under five standards: the ability to (1) facilitate and inspire student learning and creativity, (2) design and develop digital age learning experiences and assessments, (3) model digital age work and learning, (4) promote and model digital citizenship and responsibility, and (5) engage in professional growth and leadership.

UNESCO's ICT Competency Framework for Teachers (2011) groups the qualifications expected from teachers into the 3 categories of (1) technology literacy, (2) knowledge deepening, and (3) knowledge creation, each containing six performance indicators. The ICT framework emphasizes that teachers not only should possess and pass on ICT competencies on to their students but that students should also serve as citizens who can show teamwork, problem-solving, and creative thinking skills using ICT.

The European Commission (EC)'s Framework for the Digital Competence of Educators (2017) specified 22 different competencies at 6 different levels: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners. Unlike other frameworks, the EC framework includes learner competencies and the educators' pedagogic competencies along with their professional competencies.

In its study on "Teacher Competencies", the Turkish Education Association (TED) (2009) stated that the transformation in the field of education was related to the knowledge of techno-pedagogy and that teachers require knowledge of teaching pedagogy and field knowledge integrated with technology.

The UNESCO (2011), ISTE (2008), TED (2009), and EC (2017) frameworks agree that teachers must be able to use ICT tools in all stages of the learning-teaching process from planning to evaluation, develop necessary materials for this purpose, create suitable environments, be a model for the learners for the use of technology, and have acquired the competency to use technology in their professional development. Forkosh-Baruch and Avidov-Ungar (2019) highlighted similar points.

Teachers thus require professional development programs that allow them to develop their skills in integrating technology by both improving their existing skills and acquiring new methods to integrate ICT in entirely new ways for learning (Almenara, & Gimeno, 2019). Several recent studies have emphasized the lack of professional development programs for ICT integration, particularly those that facilitate the interactive sharing of the pros and cons of various classroom practices (Ifinedo, Rikala, & Hamalainen, 2020). Despite attempts, studies indicate that existing programs have not been entirely successful and often result in teachers integrating technology only as a support to their traditional practices (Blikstad-Balas, & Klette, 2019).

Furthermore, even teachers who have taken instructional technology courses face serious practical and logistical obstacles while trying to integrate technology into their lessons (So & Kim, 2009; Usluel, Mumcu & Demiraslan, 2007). According to Stein, Gurevich, and Gorev (2020), one of the greatest difficulties teachers face in integrating ICT is classroom management. In other words, in professional development courses, teachers are able to master theory and learn the technical aspects of integrating technology but continue to encounter problems in practice. This is believed to be due to the fact that practice requires the ability to analyze the case from a pedagogical perspective which is beyond basic theoretical and technical mastery (Beglau et al., 2011; Usluel, 2016). This important obstacle highlights the necessity of following approaches in professional development programs on ICT integration that facilitate learning through hands-on practice and practical experience. Professional development courses which utilize similar ICT that will be used in the classroom and that allow teachers to apply what they have learned increase the success of their ICT integration in the classroom (Hanover Research, 2014, Prestridge, Tondeur, 2015; Tondeur, Forkosh-Baruch, Prestridge, Albion, & Edirisinghe, 2016; Atman, & Usluel, 2019).

The aim of this study is to design an online professional development program that provides teachers with the opportunity to use technology effectively both within the online course for their own learning and in their classrooms using the tools available to them while teaching and to evaluate their implementation. Four research problems were identified:

(1) What is the best design of an online professional development program that aims to develop skills in integrating technology in education?

(2) What were the teachers' self-assessments on their technology-enhanced lesson implementation within the scope of the designated online course?

(3) What were the teachers' end-of-course evaluations?

(4) What were the instructors' end-of-course evaluations?

## METHODS

The study was carried out using the design-based research method (Barab & Squire, 2004). Design-based research differs from other research methods in that it removes the sharp boundaries between design and testing by combining theory and practice (Bakker & van Eerde, 2015). It is used frequently in teacher training studies and has the potential to explain and influence learning and teaching in the natural learning environment (Anderson & Shattuck, 2012). This method aims to develop interventions (educational products, processes, programs, or policies) that can serve as solutions to practical educational problems based on the theoretical understanding of the learning situation (McKenney & Reeves, 2012). McKenney & Reeves (2012) described the way in which design-based research progresses in a flexible and iterative manner through the three core phases of investigation/analysis, design/prototyping, and evaluation/retrospection. The process can be designed through various combinations of the three phases based on the need of the educational problem. The research process can span numerous meso cycles over a long period, in various combinations of these micro cycles, or may be shorter and cover three micro cycles, one from each phase. The process is iterative as the results of some elements in the process affect or enable other targeted elements or phases through repeated attempts. The process can be carried out through different pathways beyond the intended research design. During the research process, the participants are seen as partners, rather than subjects. The participation of researchers in the process, as well as that of practitioners and experts in different subject areas, are suggested in addition to continuous improvement of the design throughout the process (Barab & Squire, 2004; McKenney & Reeves, 2012).

The authors served dually as the researchers and the practitioners and conducted the online courses. The process of developing the online course was carried out in line with the educational design research method in a flexible and iterative manner. From the analysis phase to the end of the implementation phase, the research process took approximately one year to complete and consisted of the main stages of analysis, design, development, implementation, and evaluation. Figure 1 outlines the research process, with each stage of the project visualized on the horizontal line and the curved line representing the cycles of the research process. Each small circle on the curve represents sub-outcomes developed in the process. Circles on the curved line, which corresponds between the horizontal line and the expression of the team, mean that it was created in line with the work of that team. The sub-products which were developed in the process that constituted the online course as the main product were visualized on the cycles in detail.

The process was constructed using the people-process-product (P3) framework defined by Khan (2005) as crucial in e-learning project management. The P3 was also utilized in the visualization of our process (Figure 1). The content, technical, and visual design teams collaborated throughout the process which can be seen from top to bottom of People area. The process was initiated at the analysis stage by a content development team which was actively involved throughout the process. The development process was carried out by a visual design team, technical team, and content development team.

As can be seen in the more frequent and reversible cycles (Figure 1), the design and development phases, during which the content was structured and the LMS was prepared, were conducted in a more intertwined and iterative manner then the other phases. In order to reach certain saturation on content, formative evaluation was performed at each cycle, with emphasis in the design and development phases (Figure 1).

The conducted formative evaluations by the content team are represented below the horizontal line. Instant course formative evaluation was performed using an interventionist approach based on the participants' responses gathered during the implementation phase which resulted in extension of the course length. In design research, tightly integrated processes of design, evaluation, and revision can enable designers or researchers to identify problems or gaps in the process (Edelson, 2002). Formative evaluation thus holds a significant place in design-based research (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Edelson, 2002). Following the implementation, the participants' and instructors' end of course evaluations were discussed for summative evaluation purposes in the attempt to determine the effectiveness of the course.

The course plan was developed in three cycles in two phases: the first two cycles were part of the analysis phase and the third the design phase. The first version of the course plan was developed at the beginning of the analysis phase was discussed in the study by Ugur and Arkun Kocadere (2016) and the second version of the course plan developed at the end of the analysis phase was summarized in the study by Arkun Kocadere (2017). The current study discusses the entire process with a focus on the Implementation and Evaluation phases.

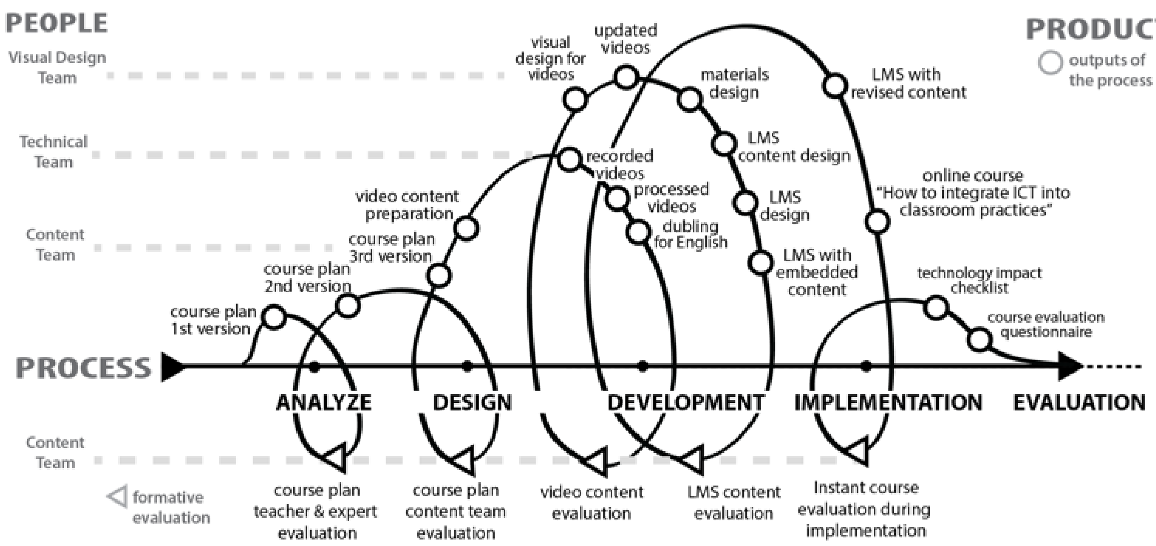


**Figure 1.** Online course development process

## Analysis and Design

Teacher competencies developed by ISTE, UNESCO, TED, and EC were taken into consideration during the analysis and design phase. The course was designed according to the Tech-PACK model (Roblyer, and Doering, 2013) which combines the Technology, Pedagogy, Content Knowledge (TPACK) model (Koehler & Mishra, 2005) and the Technology Integration Planning (TIP) model. This model consists of 7 steps under the 3 phases of (1) Analysis of Learning and Teaching Needs, (2) Planning for Integration, and (3) Post-Instruction Analysis and Revisions. The Tech-PACK model was used in the development of the online course's plan, including the topics, educational materials, and learning and assessment activities.

In addition to a detailed literature review, the opinions of nine teachers that served as representatives of participating schools in six different European countries were gathered during a focus group interview. Focus group participants confirmed the validity of the theoretical base and advised that the course be designed and applied in a manner that allows for implementation in addition to theory. One participant placed emphasis on the importance of interaction in online courses and warned about drop-out rates. Two prominent academicians in the field of Instructional Design whose research focuses on ICT integration were also invited to offer suggestions on the 1st course plan. One suggested limiting the theoretical portion and focusing on the implementation of participant teachers, as well as removing sections on ethics from the course topics. The second expert suggested adding a part which explains tools that can be used effectively in the learning-teaching process before asking the teachers to develop their own technology-enhanced lesson plans. Another suggestion was to embed the ICT-supported assessment section into previous sections instead of separating it. Both experts highlighted the importance of ICT integration in the pedagogical perspective.

The second version of the course plan was created taking into consideration the feedback from the experts and focus group participants. Two members of the content team then conducted the formative assessment process, the second course plan was revised, and a third plan created. In the third version, the content team reviewed the course from a design perspective, which led them to shorten some of the titles, convert the content a bit, and make the structure more elaborate. The decision was made to develop an online course as a good example of how to integrate ICT into education as well as to give the teachers the opportunity to develop and implement a technology-enhanced lesson plan under the supervision of their instructors and peers. Peer assessment for the technology-enhanced lesson plans developed by the participating teachers was also included in the course plan. It has been shown that the peer assessment process benefits the development of both the receiver of the feedback and the evaluator (Van den Berg, Admiraal, & Pilot, 2006).

## Development

Video content based on the second course version was created as part of the development phase. The visual design and content development teams collaborated in the creation of videos used in the course. Videos were designed with the speaker occupying half of the screen and images associated with the content in the other half. Video content was examined and evaluated by the content development team. In line with their formative evaluation, videos were processed and finalized by the technical team. English dubbing was carried out for videos shot in the mother tongue of the researchers and trainers as the participants of the course were international. The visual design team designed changing, vectoral, and illustrative visuals associated with the content.

Additional educational materials and activities were prepared after the completion of the videos. Learning management system content was prepared based on the course plan and written explanations of each activity were prepared. The learning management system was then developed by the technical team, the created content was placed in the LMS (Figure 2) and controlled. In addition, links and videos were checked to see if they work. Finally, the LMS was reviewed by the content development and visual design development teams and in line with the evaluation results.


**Figure 2.** A screenshot of the open online course

## Implementation

Our developed online course entitled "How to integrate ICT into Classroom Practices" was opened to users. During the implementation process, participating teachers were directed to focus on application practices that would enable the integration of technology in education as emphasized in the Tech-PACK model. Activities that facilitate the active learning of the tools were included in the course process in place of passive lessons about technological tools. In this way, teachers were able to learn how to use the tool they chose on their own and then deploy them in their own learning processes. Technological knowledge was put into practice and technology training was provided so that the teachers were enabled to introduce the experience they gained during the training process in their own classrooms. Teachers interacted with colleagues and educators throughout the course by sharing their work and receiving feedback. The course was planned in 4 modules for a duration of 4 weeks. However, the duration of the course was extended in practice by considering the teachers' demands to have longer time for implementation in their own classrooms. During the implementation process, participant problems such as logging into the system or completing a learning activity were monitored. Any e-mails sent from the participants regarding course problems were analyzed in detail by the instructor/researchers.

## Evaluation

In addition to the formative assessments performed during the process in all other steps, the final step was the evaluation step. For the summative evaluation at the end of the implementation, participants were asked to apply the technology-enhanced lesson plans they developed and evaluate the process using a technology impact checklist in an attempt to evaluate the contribution of the online course. Teachers' views on the online course were identified in the end-of-course evaluation questionnaire. The online course development process was also evaluated by the instructors using the Rubric for Online Instruction.

The developed "How to integrate ICT into classroom practices" class can be summarized as follows:

### Module 1: ICT Integration into Education

Video 1: Welcome

Sharing 1: Example tools to create your poster

Activity 1: Create your poster for Ice breaking activities

Video 2: ICT integration into teaching and learning process

Sharing 2: International ICT competencies

Activity 2: TPACK survey

Activity 3: Submit ICT Competencies in Your Country

Video 3: 21st century learners and teachers

Sharing 3: Example tools to create your digital story

Activity 4: Create your digital story

### Module 2: Planning for Integration

Video1: Effective learning environments

Activity 1: Determine Learning Situation

Video 2: Educational materials

Sharing 1: Example Tools and Resources

### Module 3: Development for Integration

Video 1: Coming into power

Video 2: Learning and teaching process design

Video 3: Tools in learning and teaching process

Sharing 1: Example lesson plans template

Activity 1: Submit your Lesson Plan and Materials

Sharing 2: Tool Examples

### Module 4: Instruction and Reflection

Activity 1: Assess yourself

Activity 2: Reflection about your lesson

Activity 3: End-of-course evaluation questionnaire

Sharing 1: Certificate

After the course was developed, it was advertised on different websites, social media platforms and through an official notice to the Ministry of Education and teacher volunteers completed a registration form created by the researchers to delineate the study group. A total of 171 teachers from four different European countries were enrolled in the course. Of these, 47 actively participated and made at least one submission. A total of 36 were awarded a certificate upon completion of the course. The study group included the 36 participants who received a certificate. Participant characteristics are summarized in Table 1, based on the registration form data.

Table 1. Demographic data of the study group

| | | n | % |
|---|---|---|---|
| Country | Turkey | 7 | 20 |
| | Romania | 14 | 37 |
| | Spain | 12 | 34 |
| | Italy | 3 | 9 |
| Gender | Female | 34 | 94 |
| | Male | 2 | 6 |
| Type of School | Primary School | 2 | 6 |
| | Secondary School | 15 | 41 |
| | High School | 19 | 53 |
| Subject Matter | Fine Arts | 1 | 3 |
| | Humanities and Social Sciences | 15 | 42 |
| | Linguistic Sciences | 16 | 44 |
| | Science and Engineering | 4 | 11 |
| Age | 25-34 | 5 | 14 |
| | 35-44 | 16 | 44 |
| | 45-54 | 11 | 31 |
| | 55-64 | 4 | 11 |
| Teaching Experience (Year) | 1-5 | 4 | 11 |
| | 6-10 | 5 | 14 |
| | 11-15 | 5 | 14 |
| | 16-20 | 10 | 28 |
| | 21-25 | 5 | 14 |
| | 26-30 | 3 | 8 |
| | 31-35 | 4 | 11 |
| Taken a course about technology use in education | Yes | 30 | 83 |
| | No | 6 | 17 |
| Taken an online course | Yes | 26 | 72 |
| | No | 10 | 28 |
| ICT literacy rating | 1-2 | 1 | 3 |
| | 3-4 | 5 | 14 |
| | 5-6 | 10 | 28 |
| | 7-8 | 14 | 39 |
| | 9-10 | 6 | 16 |

The study group was heterogeneous in all respects with the exception of gender (Table 1). In addition, 83% of participants had previously taken a course on the use of technology in education and 72% had previous online course experience. The median ICT literacy rate was 7. Accordingly, it can be said that the ICT competencies of the participants were sufficient.

An important feature of the course was its focus on applied practice. During the course, participating teachers implemented technology-enhanced lesson plans and performed self-assessment using the Technology Impact Checklist presented by Roblyer and Doering (2013). The checklist consisted of 11 yes or no questions with an optional comment section for each question. Data were analyzed to answer the second sub-problem of the study.

At the end of the course, participants completed the End-of-course Evaluation Questionnaire developed by the researchers. The use of an after-course assessment is recommended in the literature for summative purposes (Jones, 2012; O'Neil, Fisher & Newbold, 2004; Peterson, 2016). Questions were prepared after a review of the literature and in accordance with the objectives of the course. Questions were graded on a scale from "1 - strongly disagree" to "7 - strongly agree". The prepared questions were transferred to the online environment and expert opinion was obtained from five experts on the appearance and content validity of the questions. Yurdugul and Bayrak (2012) suggested to calculate kappa statistics on a case where a small number of experts were reached for investigating content validity. Therefore, kappa statistics were calculated for each item: it was determined that all eight items were appropriate. To determine internal consistency, the Cronbach's Alpha coefficient for the eight Likert questions was calculated as .941. The third sub-problem of this research was addressed by analysis of the questionnaire data.

Course evaluation was performed by the two instructor/researchers using the Rubric for Online Instruction (California State University Chico, 2014). The use of this rubric by the course instructors in order to determine how to update a given course is one of the methods suggested by its developers. The Rubric consists of 25 items under 6 categories: Learner Support & Resources, Online Organization & Design, Instructional Design & Delivery, Assessment & Evaluation of Student Learning, Innovative Teaching with Technology, and Faculty Use of Student Feedback. Items are graded under the triple scale of "baseline", "effective", and "exemplary". The instructor/researchers performed a joint evaluation of the course using the Rubric for Online Instruction.

As can be seen in Figure 1, data were collected online at the end of the lesson using the Technology Impact Checklist, End-of-course Evaluation Questionnaire and Rubric for Online Instruction. Descriptive statistics were used to describe the data and data was reported as percentage, frequency, and medians. Additionally, optional comments filled in by participants after the items of Technology Impact Checklist were presented.

## FINDINGS

### Self-assessment of Teachers on Their Implementation

A total of 35 teachers completed the Technology Impact Checklist after preparing and implementing their lesson plans. According to the results of their self-assessments, participants rated their implementation as "high" in items 2, 4, and 6, "intermediate" in items 1, 3, 7, and 8, and relatively "low" in items 5, 9, 10, and 11 (Table 2). Any optional comments given were also reviewed and reported.

**Table 2.** Self-assessment of teachers on their implementation via technology impact checklist

| Technology impact checklist items | | % | |
|---|---|---|---|
| | | Yes | No |
| How Do You Know When You Have Integrated Technology Well? | | | |
| 1 | An outside observer sees the technology activity as a seamless part of the lesson. | 68.57 | 31.43 |
| 2 | The reason for using the technology is obvious to you, the students, and others. | 100 | 0 |
| 3 | The students are focusing on learning, not on the technology. | 74.29 | 25.71 |
| 4 | You can describe how technology is helping a particular student. | 91.43 | 8.57 |
| 5 | You would have difficulty accomplishing lesson objectives if the technology weren't there. | 57.14 | 42.86 |
| 6 | You can explain easily and concisely what the technology is supposed to contribute. | 100 | 0 |
| 7 | All students are participating with the technology and benefiting from it. | 77.14 | 22.86 |
| How Do You Know When You Have Not Integrated Technology Well? | | | |
| 8 | You consistently see the technology as more trouble than it is worth. | 31.43 | 68.57 |
| 9 | You have trouble justifying cost and preparation time in terms of benefits to your students. | 48.57 | 51.43 |
| 10 | Students spend more time trying to make the technology work than on learning the topic. | 48.57 | 51.43 |
| 11 | The problem you were trying to address is still there. | 42.86 | 57.14 |

All teachers stated that the reason why technology is used in the learning process was clearly perceived by both themselves and the students (item 2) and that they could easily and briefly explain how the technology would contribute to the learning process (item 6).

> *"With the help of technology, students work more effectively while having fun of the thing they have done compared to the traditional paper studies." (T17)*
>
> *"Yes, because it is a modern / current teaching and offers a multitude of opportunities / facilities to develop the students' skills desired." (T34)*
>
> *Technology contributes to make students select, organize and present the required information. (T3)*
>
> *The technology motivates them and helps them to find and present the information in a more attractive form. (T10)*
>
> *As a teacher, I don't want to be the only source of knowledge, learning or help. Technology helps my students understand subjects and explore the universe or their own skills better. (T13)*

Almost all teachers (91.43%) stated that they could explain how technology helped students (item 4). Of those, 31.25% associated this with student motivation and reported that the technology makes the learning process more interesting and effective.

> *"I could observe how technology motivated students who find difficult my subjects: geography and history." (T3)*
>
> *"The technology motivates him and helps him to find and present the information in a more attractive form." (T8)*
>
> *"When the teacher uses technology, he makes his lessons more interesting for all the students." (T22)*
>
> *"Technology helps teachers to teach in a visual way. Students don't forget easily when they use technology." (T18)*
>
> *"The students don't want to read or listen to a classical lesson, so if we use technology they become interested." (T27)*

Three-quarters (74.29%) of participants stated that their students were focused on learning rather than on technology during the learning-teaching process (item 3).

> *"Students are focused on learning and technology can enrich learning experiences and gives them the opportunity to make connections with the real world, to find resources, and create products." (T9)*

According to 77.14% of the teachers, all students interacted with and benefited from technology (item 7) while 68.57% stated that technology was an integral part of the process (item 1) and that it contributed to the teaching process rather than being a problem (item 8).

> *"When we plan our lesson well, technology doesn't cause more trouble." (T13)*
>
> *"if we use technology correctly, it will be useful." (T18)*
>
> *"If the lesson is not carefully planned technology could result in a waste of time." (T5)*
>
> *"ICT integration is more to do and learn for teachers but it's worth it." (T32)*

On the necessity of the use of technology, 57.4% of participants reported that they would have had difficulty in achieving the learning objectives without technology (item 5) while 25% of these teachers related these views with the harmony between the learning objective and the content and technology. They also emphasized that the contribution of technology differed according to certain situations.

> *"Absolutely right. As an EFL teacher, if I don't use technology in my classes my students won't be able to learn well, practice, or revise so often." (T13)*
>
> *"Well, sometimes it's very useful, but not always, when teaching literature." (T33)*

Half of the teachers (51.43%) stated that providing the necessary time and budget for the use of technology in the learning process was not a problem (item 9). T2 and T3 stated that although it required more time, the use of technology is necessary and worth the effort.

> *"It is a requirement and I rather prefer to see how my students learnt rather than worry about spending time." (T2)*
>
> *"I am really satisfied with the student's efforts to complete the task. I would not change the activity although it means much more work for me." (T3)*

The same percentage of teachers (51.43%) agreed that students were focused on learning rather than technology (item 10) and 57.14% reported that they were able to solve their target learning problem using technology (item 11). Conversely, thinking that students focus on technology rather than content, T7 stated that learning to use a new tool requires a significant amount of time and concentration.

> *"Using a web tool for the first time requires a lot of time and concentration." (T7)*

T10, who, similar to T7, discussed how technology required time, added that they could produce solutions to this problem by extending the working time.

> *"In some moments, but we solved adding more time to work." (T10)*

T15 stated that technology caused problems rather than contributing to solving the problem and that the use of technology required more time whereas T16 expressed that the learning outcomes were better with the use of technology.

> *"They may spend more time but learn better. For example, they play games and they learn vocabulary and daily language better. I think it gives them a chance to explore something by themselves." (T15)*
>
> *"Although they learn it better." (T16)*

## End-of-Course Evaluation

In order to determine the effect of the developed course, the End-of-course Evaluation Questionnaire consisting of 8 questions and scaled from 1 to 7 was answered by the participants at the end of the course (n = 35). Since the answers are at ordinal level of scale, both percentage and median values are reported in Table 3.

**Table 3.** Results of Teachers' End-Of-Course Evaluation (percentages and medians)

| | | 1 (%) | 2 (%) | 3 (%) | 4 (%) | 5 (%) | 6 (%) | 7 (%) | Median |
|---|---|---|---|---|---|---|---|---|---|
| 1 | The course objectives and expectations were clear. | 3 | 0 | 0 | 3 | 9 | 40 | 46 | 6 |
| 2 | I gained an understanding of ICT integration into education. | 0 | 0 | 3 | 3 | 17 | 34 | 43 | 6 |
| 3 | I developed skills or learned concepts that I can apply to my classroom. | 0 | 0 | 0 | 11 | 14 | 26 | 49 | 6 |
| 4 | I am able to think more critically or deeply about ICT integration into education. | 0 | 0 | 0 | 9 | 26 | 40 | 26 | 6 |
| 5 | The course met my expectations. | 3 | 0 | 3 | 3 | 23 | 26 | 43 | 6 |
| 6 | The course tasks helped me to improve myself about ICT integration into education. | 0 | 3 | 0 | 0 | 11 | 31 | 54 | 7 |
| 7 | Videos and other course materials were helpful to understand ICT integration into education. | 3 | 0 | 3 | 3 | 14 | 40 | 37 | 6 |
| 8 | The course provided enough opportunities for me to demonstrate what I had learned. | 0 | 3 | 0 | 6 | 17 | 37 | 37 | 6 |

The median value of all but one question was 6 while the question on whether the course tasks helped improve participants" ability to integrate ICT in education received a mean score of 7. In addition to the questions in Table 3, the participants were asked whether they suggested this course to other educators. Only one participant responded negatively to this question while the other 34 said they would suggest the course to other educators, suggesting that the course was successful.

## Instructor Evaluation

The course evaluation provided by the two instructor/researchers using the Rubric for Online Instruction is given in Table 4. Scores were given as "baseline", "effective", and "exemplary". Comments were mostly provided on items that did not receive full scores and suggestions for the improvement of the course were given.

A score of "effective" was given to the presentation of resources and content to support different learning abilities in the "Learner Support & Resources" category. Despite numerous undertakings, further efforts to provide a variety of course-specific resources are needed.

In the online Organization & Design category, a full score of “exemplary” was given as the course was believed to be well-organized. The amount of time allocated to the analysis, design, and development phases was believed to strengthen the course in this respect. In addition, the orientation video was evaluated as effective in providing adequate information and expectations. In the category of Instructional Design & Delivery, the item that did not receive a full score was that of “offering interaction and communication student to student, student to instructor and student to content”. It was concluded that the course did not allow for intense student-instructor interaction due to the chosen WordPress infrastructure and preferred strategy.

All questions in the Assessment & Evaluation of Student Learning category were determined to have “effective” values. Full scores were not given as evaluations were not performed on several occasions and continuous feedback was not received throughout the course period. While peer-review was encouraged and feedback provided to several teachers, not all participants received/gave feedback on a weekly basis. On the other hand, as assignments were seen by all participants, the feedback provided could be considered by other teachers. The feedback was particularly centered during the course plan development and implementation weeks. Each teacher’s plan received feedback from one instructor and two peers. In this context, this category was determined to be “effective”.

The categories of Innovative Teaching with Technology and the Faculty Use of Student Feedback did not receive full scores on all items for similar reasons to those described above. A sufficient level of innovative technology was used for communication and learning, and new teaching methods were utilized. However, this did not reach the level of a “variety of technology”, and therefore the course was considered to be at the “effective” level in the Innovative Teaching with Technology category.

Participant evaluations in the Faculty Use of Student Feedback category were taken only at the end of the course. While the remarks conveyed as messages during the course process were also taken into account, no multiple opportunities were provided for the students to give feedback on the course.

**Table 4.** Instructors’ remarks regarding the online course

| Categories | Baseline | Effective | Exemplary |
|---|---|---|---|
| Learner Support & Resources (3 criteria) | 0 | 1 | 2 |
| Online Organization & Design (5 criteria) | 0 | 0 | 5 |
| Instructional Design & Delivery (5 criteria) | 0 | 1 | 4 |
| Assessment & Evaluation of Student Learning (5 criteria) | 0 | 5 | 0 |
| Innovative Teaching with Technology (4 criteria) | 0 | 4 | 0 |
| Faculty Use of Student Feedback (3 criteria) | 0 | 2 | 1 |

## DISCUSSIONS AND CONCLUSION

Teachers and their professional development are among the most important elements determining the success of the integration of technology in the education process. Although many professional training opportunities are provided in this direction, the literature shows that these trainings remain theoretical and do not allow teachers to implement the integration in which they are instructed. Therefore, any professional development should include hands-on training. This requirement has been emphasized in various competencies developed by different institutions and organizations such as UNESCO (2011), ISTE (2008), TED (2009), EC (2017).

Furthermore, teaching technology alone does not provide a sufficient point of view in terms of providing technology integration into education. Technology is a tool that changes every day, necessitating the ability to select the appropriate tools and follow a holistic perspective to improve teaching. In line with this, the focus of the current study is the open online course entitled “How to integrate ICT into classroom practices” developed to emphasize practical integration based on the Tech-PACK Model (Roblyer & Doering, 2013).

The prominent aim part of the course was to support teachers to develop a technology-enhanced lesson plan for teachers in their classrooms and to support this process with feedback from both peers and instructors. In addition, participating teachers were able to use the discussed technologies in a context that serves their own learning.

The aim of this study was to design and then evaluate the implementation of an online professional development program to fill the gap in the literature. The study was carried out using the design-based research method. Evaluation of the developed course was performed based on the self-assessment of the participants about the practices in their classes, end-of-course evaluation questionnaire answers, and the results of an evaluation performed by the instructors who conducted the online course.

Teacher self-assessment of technology-enhanced applications is considered to be an important indicator of evaluation of the online course, beyond being an important part of their learning processes. In our course, participants were asked to question the extent to which they could integrate technology and their strengths or weaknesses in their self-assessment. Self-assessment results showed teachers rated themselves as strong in technology-enhanced course planning but weaker when it came to the practical application due to the many variables involved in the process. Teachers stated that they could easily explain the possible contributions of technology to the teaching and learning process and could easily justify a technology-enhanced structure to create a lesson plan. They stated that they were not as strong in the classroom as in the planning stage and they focused on learning rather than technology as an integral part of the learning process. However, even when the difficulties in implementation and the need for additional time are considered, more than half of the teachers agreed that the use of technology is an advantage. Teachers' experience with the instructor and colleague feedback in relation to the relationship between planning and implementation was the most important gain for them during the course.

Based on the end-of-course evaluations, teachers reported that they gained awareness and skills about ICT integration, the content clear and understandable, the course met their expectations, and the course materials and tasks were useful. In addition, participants had the opportunity to show what they learned. Based on these results, it can be said that the objectives of the course were achieved within the limitations of the study. In addition, 97% of the participants suggested the course to others, indicative of their satisfaction with the course (Contreras-Castillo, Favela, Pérez-Fragoso & Santamaria-del-Angel, 2004; Endres, Chowdhury, Frye & Hurtubis, 2009).

Following its completion, the instructor/researchers evaluated the course using the 6-category Rubric for Online Instruction. The Learner Support & Resources (2.60 / 3.00), Online Organization & Design (3.00 / 3.00), and Instructional Design & Delivery (2.80 / 3.00) categories scored as "exemplary", the top value of the rubric, while the Assessment & Evaluation of Student Learning (2.00 / 3.00), Innovative Teaching with Technology (2.00 / 3.00), and Faculty Use of Student Feedback (2.33 / 3.00) were evaluated as "effective", the intermediate value of the rubric. The quality of the analysis, design, and development process of the course was considered as the reasons for the full score in the Online Organization & Design category.

Items that did not receive full points were not the result of mistakes made during implementation but of preferences made during the course design stage. It was not possible to know ahead of time the number of teachers that would participate in an open course and thus considering the limited number of instructors, a plan that would allow for an intense student-instructor interaction was not devised. Although it is known that satisfaction with online learning is directly related to such interaction, it is usually not possible to provide it in massive open online courses. Peer assessment is preferred in MOOCs and it is a suitable strategy for the teacher to provide feedback on some student assignments which can be followed by all participants (Huisman, Admiraal, Pilli, van de Ven, & Saab, 2018; Suen, 2014). A similar strategy was adopted in our course and weekly activity assignments were posted on the course platform to allow all participants access and some assignments received feedback from the instructors. In addition, instructors prepared and shared an assignment for each activity (For example a digital story about the lives of 21st century students) in order to close the feedback gap. On the other hand, feedback from two peers and one instructor was provided on the technology-enhanced lesson plans that were to be implemented and developed by the teachers, which is thought to be the most powerful part of the course. Therefore, the Assessment & Evaluation of Student Learning and the Innovative Teaching with Technology categories were rated "effective".

Since the participant feedback on the course was collected only at its completion, the Faculty Use of Student Feedback category was similarly considered to be "effective". However, this might be due to the fact that the course process was planned over a duration of only 4 weeks, a relatively short period of time, to allow for feedback for the planning of the rest of the course. Considering that the developer of the rubric is a university, one semester was taken as the duration of the course and mentioned in the rubric items.

The implementation of the "How to integrate ICT into classroom practices" open online course was evaluated from different perspectives. The evaluations concluded that the next implementation of the course should aim to improve the online interaction and the extent of classroom application by the teachers. First, greater student-instructor interaction can be achieved by taking the instructor's workload into account and organizing live classes in set time periods. The feedback based on performed activities can be provided during these live classes to enable more participants to benefit. Interactive videos would increase student-content interaction. Additionally, the inclusion of different e-measurement tools in the learning process would allow participants to evaluate their learning. The addition of activities that can be performed jointly and the use of collaborative web tools and peer feedback could be encouraged not only for the lesson plans but for each activity to encourage greater student-student interaction. The LMS used to increase the interaction may need to be replaced or supported by plug-ins that allow for more communication. In addition to system interaction, it would be appropriate to further strengthen the application, which is an important aspect of the course. To achieve this, the application module of the course should be planned for a longer-term and with a repeating structure and the teachers' performance of at least one more practice in the classroom would be a significant improvement. A recent meta-analysis study of 30 studies on online learning courses by Castro and Tumibay (2019) report similar suggestions, particularly those on interaction and formative feedback. We believe that the efficiency of the course will increase with these planned improvements.

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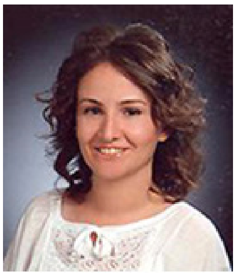

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## REFERENCES


Almenara, J. C., & Gimeno, A. M. (2019). Information and Communication Technologies and initial teacher training. Digital models and competences. *Profesorado-Revista De Curriculum Y Formacion De Profesorado, 23*(3), 247-268.

Anderson, T., & Shattuck, J. (2012). Design-based research: a decade of progress in education research?. *Educational Researcher*, *41*(1), 16-25. https://doi.org/10.3102/0013189X11428813

Arkun Kocadere, S. (2017). Integration of ICT into Education within the Framework of an Erasmus+ Project. In: Yasemin Usluel (Ed.), *Various Aspects of ICT Integration in Education* (pp. 465 - 484), Gazi Kitabevi, Ankara.

Atman Uslu, N., & Usluel, Y. K. (2019). Predicting technology integration based on a conceptual framework for ICT use in education. *Technology, Pedagogy and Education, 28*(5), 517-531.

Ayaz, M. F., Oral, B., & Soylemez, M. (2015). Evaluation of the post-graduate theses on teacher education in Turkey. *Elementary Education Online, 14*(2), 787-802. http://dx.doi.org/10.17051/io.2015.89009

Bakker A., & Van Eerde D. (2015). An Introduction to design-based research with an example from statistics education. In: A. Bikner-Ahsbahs, C. Knipping, & N. Presmeg (eds.) *Approaches to qualitative research in mathematics education. Advances in Mathematics Education* (pp. 429-466). Springer, Dordrecht. https://doi.org/10.1007/978-94-017-9181-6_16

Barab, S., & Squire, B. (2004). Design-based research: putting a stake in the ground. *Journal of the Learning Sciences, 13*(1), 1–14. https://doi.org/10.1207/s15327809jls1301_1

Beglau, M., Craig-Hare, J., Foltos, L., Gann, K., James, J., Jobe, H., ... & Smith, B. (2011). *Technology, coaching, and community: Power partners for improved professional development in primary and secondary education.* Retrieved from https://www.ri-iste.org/Resources/Documents/Coaching_Whitepaper_digital.pdf

Blikstad-Balas, M., & Klette, K. (2019). Still a long way to go. N*ordic Journal of Digital Literacy, 15*(01), 55-68.

California State University Chico (2014). Rublic for Online Instruction. Retrieved from https://bit.ly/2W0bGFl

Castro, M.D.B., Tumibay, G.M. (2019). A literature review: efficacy of online learning courses for higher education institution using meta-analysis. Education and Information Technologies. https://doi.org/10.1007/s10639-019-10027-z

Contreras-Castillo, J., Favela, J., Pérez-Fragoso, C., & Santamaria-del-Angel, E. (2004). Informal interactions and their implications for online courses. *Computers & Education*, *42*(2), 149-168. https://doi.org/10.1016/S0360-1315(03)00069-1

Dede, C., Jass Ketelhut, D., Whitehouse, P., Breit, L., & McCloskey, E. M. (2009). A research agenda for online teacher professional development. *Journal of Teacher Education*, *60*(1), 8-19. https://doi.org/10.1177/0022487108327554

Edelson, D. C. (2002). Design research: What we learn when we engage in design. *The Journal of the Learning sciences*, *11*(1), 105-121. https://www.cs.uic.edu/~i523/edelson.pdf

Endres, M. L., Chowdhury, S., Frye, C., & Hurtubis, C. A. (2009). The multifaceted nature of online MBA student satisfaction and impacts on behavioral intentions. *Journal of Education for Business*, *84*(5), 304-312. https://doi.org/10.3200/JOEB.84.5.304-312

Evans, S. A. (2006). A validation study of a measurement of technology integration skills for pre-service teachers. (Doctoral dissertation, The University of North Carolina at Charlotte) Retrieved from https://www.learntechlib.org/p/121000/

Forkosh-Baruch, A., & Avidov-Ungar, O. (2019). ICT Implementation in Colleges of Education: A Framework for Teacher Educators. Journal of Information Technology Education, 18, 207-229.

Gao, P., Tan, S. C., Wang, L., Wong, A., & Choy, D. (2011). Self reflection and preservice teachers' technological pedagogical knowledge: Promoting earlier adoption of student-centred pedagogies. *Australasian Journal of Educational Technology,* 27(6), 997-1013. https://doi.org/10.14742/ajet.925

Guskey, T. R. (2007). Results-oriented professional development. In: A. C. Onstein, E. F. Pajak and S. B. Ornstein (eds.), *Contemporary issues in curriculum* (pp. 334–346), Pearson Education, Boston.

Hanover Research (2014). Professional development for technology integration. Retrieved from https://ts.madison.k12.wi.us/files/techsvc/Professional Development for Technology Integration.pdf

Hew, K. F. & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Education Tech Research Dev, 55*(3), 223-252. https://doi.org/10.1007/s11423-006-9022-5

Herzig, R. G. M. (2004). Technology and its impact in the classroom. *Computers & Education*, *42*(2), 111-131. http://dx.doi.org/10.1016/S0360-1315(03)00067-8

Huisman, B., Admiraal, W., Pilli, O., van de Ven, M., & Saab, N. (2018). Peer assessment in MOOCs: The relationship between peer reviewers' ability and authors' essay performance. *British Journal of Educational Technology*, *49*(1), 101-110. https://doi.org/10.1111/bjet.12520

Ifinedo, E., Rikala, J., & Hamalainen, T. (2020). Factors affecting Nigerian teacher educators' technology integration: Considering characteristics, knowledge constructs, ICT practices and beliefs. *Computers & Education, 146*, 103760.

International Society for Technology in Education (ISTE). (2008). National Educational Technology Standards (NETS) for teachers. Retrieved from https://bit.ly/2SwYZ1R

International Society for Technology in Education (ISTE). (2012). National Educational Technology Standards (NETS) for teachers. Retrieved from https://bit.ly/2GbdUJa

Jones, S. J. (2012). Reading between the lines of online course evaluations: identifiable actions that improve student perceptions of teaching effectiveness and course value. *Journal of Asynchronous Learning Networks, 16*(1), 49-58. Retrieved from https://bit.ly/2T5ghYN

Kaya, G., & Kocak Usluel, Y. (2012). Content analysis of factors affecting ICT integration in teaching-learning process. *Journal of Buca Faculty of Education, 31*, 48-67. Retrieved from https://bit.ly/2NwGvNQ

Khan, B. H. (Ed.). (2005). *Managing e-learning: Design, delivery, implementation, and evaluation.* IGI Global.

Koehler, M. J., & Mishra, P. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of educational computing research*, *32*(2), 131-152. https://doi.org/10.2190/0EW7-01WB-BKHL-QDYV

McKenney, S., & Reeves, T. C. (2012). *Conducting educational design research*. Routledge.

O'Neil, C. A., Fisher, C. A., & Newbold, S. K. (2004). *Developing an online course: best practices for nurse educators*. Springer Publishing Company.

Peterson, J. L. (2016). Formative evaluations in online classes. *Journal of Educators Online, 13*(1). Retrieved from https://bit.ly/2zErnFv

Pierson, M. E. (2001). Technology integration practice as a function of pedagogical expertise. *Journal of Research on Computing in Education, 33*(4), 413- 430. https://doi.org/10.1080/08886504.2001.10782325

Prestridge, S., & Tondeur, J. (2015). Exploring elements that support teachers' engagement in online professional development. *Education Sciences, 5*(3), 199-219.

Redecker, C. (2017). *European Framework for the Digital Competence of Educators: DigCompEdu.* Y. Punie, (ed.). Publications Office of the European Union, Luxembourg. https://dx.doi.org/10.2760/159770

Roblyer, M. D., & Doering, A. H. (2013). *Integrating educational technology into teaching*: Pearson New International Edition. Pearson Higher Ed.

Stein, H., Gurevich, I., & Gorev, D. (2020). Integration of technology by novice mathematics teachers–what facilitates such integration and what makes it difficult?. *Education and Information Technologies, 25*(1), 141-161.

So, H. J. & Kim, B. (2009). Learning about problem based learning: Student teachers integrating technology, pedagogy and content knowledge. *Australasian Journal of Educational Technology, 25*(1), 101-116. https://doi.org/10.14742/ajet.1183

Suen, H. K. (2014). Peer assessment for massive open online courses (MOOCs). *International Review of Research in Open and Distributed Learning*, *15*(3), 312-327. http://www.irrodl.org/index.php/irrodl/article/view/1680/2904

Tondeur, J., Forkosh-Baruch, A., Prestridge, S., Albion, P., & Edirisinghe, S. (2016). Responding to challenges in teacher professional development for ICT integration in education. *Educational Technology & Society, 19*(3), 110–120.

Turk Egitim Dernegi (TED) (2009). Ogretmen *yeterlikleri [Teacher competencies].* Turk Egitim Dernegi. Retrieved from https://bit.ly/2IGfKrF

Ugur, B. & Arkun Kocadere, S. (2016). Ogrenme ve ogretme surecine BIT entegrasyonu: Bir cevrimici ogretmen egitimi onerisi [ICT integration into the learning and teaching process: An online teacher training proposal]. XVIII. Akademik Bilisim Konferansi (AB16) Proceedings. Retrieved from https://ab.org.tr/ab16/bildiri/290.pdf

Usluel, Y. K. (2016). Teknolojinin ogrenme-ogretme surecine entegrasyonu [ICT integration into learning-teaching process]. In I. Unal, Y. ve Kocak Usluel (Ed.), Prof. Dr. Mustafa Aydin'a Armagan - Egitim Bilimleri Yazilari (pp. 321-338). Ankara: Gazi Kitabevi.

Peterson, J. L. (2016). Formative evaluations in online classes. *Journal of Educators Online, 13*(1). Retrieved from https://bit.ly/2IGfKrF

UNESCO (2011). *UNESCO ICT Competency framework for teachers.* P. Hine (ed) Retrieved from https://bit.ly/2V9TuYC

Usluel, Y. K., Mumcu, ,F. K., & Demiraslan Y. (2007). ICT in the learning-teaching process: teachers' views on the integration and obstacles. *Hacettepe University Journal of Education,* 32, 164-179. Retrieved from https://bit.ly/2U7DOF0

# QUALITY ASSESSMENT OF ONLINE DISCUSSION FORUMS: CONSTRUCTION AND VALIDATION OF A SCALE THAT VALUES STUDENT PERCEPTION

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## ABSTRACT

Online learning is a reality in much of the world. Among the tools available for online learning, there are Online Discussion Forums (ODF), due to their potential to promote collaborative learning. However, there is a lack in the literature about the evaluation of the forums, a gap marked by the absence of quantitative tools that make it possible to evaluate the forums from the student's perspective. In this sense, the objective of this paper was to develop and validate a Quality Perception of Online Discussion Forums (QPODF) scale. To this end, quantitative research was carried out with students of postgraduate courses *lato sensu* the online distance education. Exploratory factor analysis and confirmatory factor analysis was used to validate the QPODF scale. The results demonstrate that the quality of the construct perceived online discussion forums has two dimensions "Forum Structure" and "Forum Mediation." The two identified factors were shown to be consistent and accurate to measure the quality of online forums. Moreover, the theoretical approach used to compose the scale is convergent with the measurement model proposed in the paper.

**Keywords:** Discussion forum online, online learning, Structural Equation Modeling, collaborative learning.

## INTRODUCTION

Online learning is becoming an increasingly attractive option in the field of education. In this sense, teaching and learning online tools are developed to support distance education. They are thereby resulting in the availability of new online learning tools that have enormous potential for collaborative learning (Cacheiro-Gonzalez et al., 2019; Ting, 2013; Tan, 2006). Among the educational alternatives available for the educations professionals can highlight the use of the Online Discussion Forums (ODF). The use of ODF encourages more in-depth analysis and critical reflection by participants (Chang, Chen and Hsu, 2011). Participants in the forums can also work alone or interacting with their peers (Alzahrani, 2017). These spaces for debates consist of environments characterized by timeless communication, with specific social locus where there is a debate of ideas, exchange of experiences, and the construction of knowledge about a particular theme (Cacheiro-Gonzalez et al., 2019; AlJeraisy et al., 2015).

In universities, ODF is a tool very utilized in the students' teaching-learning process. (Cacheiro-Gonzalez et al., 2019; Alzahrani, 2017; Aljeraisy, et al., 2015; Blackmon, 2012; Chang, Chen, & Hsu, 2011; He, 2012; McNamara and Burton, 2009; Andresen, 2009). Due to social and collaborative environment interaction, ODF can have a positive effect on the academic achievement of students (Tan, 2017; Wei, Peng & Chou, 2015; Jacob, 2012; Koole, et al., 2014; Xia, Fielder & Siragusa, 2013; Shana, 2009). In general, students have been receptive to the ODF (Tan, 2017; Revill & Terrell, 2005). However, to make the most effective ODF, many presuppositions need to be addressed. For example, present the activity goals, provide specific material, ask questions that promote reflection and discussion, and have tutors who know realize timely interventions. For this, existing literature a few parameters determining the quality about ODF (Parks-Stamm Zafonte & Palenque, 2017; Nandi, Chang & Balbo, 2009; McNamara & Brown, 2008; McLoughlin & Luca, 2000; Wozniak & Silveira, 2004; Graham, et al., 2001;). These parameters serve as guides for the evaluation of ODF.

Cameron (2009) draws attention to the importance of discussing ways of evaluation of ODF. In the literature, evaluation methods of the ODFs can be classified into quantitative and qualitative. The quantitative approach involves simple counting procedures on the production of students. Thus, indicating a limitation of lack of content analysis, resulting in passivity on the part of students (Nunes et al., 2014; Shaul, 2007). The qualitative approach, in turn, emphasizes the particular content, using mostly rubrics (Nandi, Chang & Balbo, 2009). But features as the central limitation time and effort that the teacher needs to undertake the evaluation (Shaul, 2007). In the same sense, there is the use of data mining techniques to generate reports (Feldman, 2007; Ellis, 2005; Dringus & Ellis, 2005;) and the use of self-assessment mechanisms of the pairs (Lee, 2008).

As can be observed, the evaluation of an ODF can have several characteristics, such for example, a reflective summary, an online survey, peer review tasks (Tan, 2017; Vonderwell et al., 2007). Hulkari and Mahlamaki-Kultanen (2008) suggest that an objective tool to measure learning evidenced by online discussion has not yet been developed. The absence of surveys to assess the quality of ODF on the student perspective is notorious. In this framing of quality assessment, it was noted that the students' judgment has an essential role because if there is a perception of quality, it is a sign that collaborative learning happens. Also, quality perception surveys can help educators to make improvements in the forums according to the quality principles observed in the literature (Nandi, Chang & Balbo, 2009).

Because of the deficiency of quantitative instruments for assessing the quality of ODF, this study aims to develop and validate a Quality Perception of Online Discussion Forums (QPODF) scale, from the student's perspective. It's about a psychometric scale that will allow the evaluation of the ODF in different educational contexts. To achieve the objective of the research, a survey was carried out with the graduates of *lato sensu* postgraduate courses, enrolled in online distance learning.

## ONLINE DISCUSSION FORUMS' BRIEF BACKGROUND

Online discussion forums are tools that allow users or students to share ideas, questions, opinions, and interact with other members in a friendly learning environment. The forums are also a mode of Computer-Mediated Communication asynchronous, which allows participants to communicate with classmates in different situations (Conrad & Dabbagh, 2018; Tan, 2017; Ting, *et al.*, 2013). According to Biondo (2018) and Sanchez (2005), the ODF can be understood as a space for communication characterized by dialogues and messages classified according to the topic discussed. Thus, during the interactions, students can make contributions, clarify points of view, or refute ideas of the other participants.

From this perspective, the discussion forums online enable the collaborative learning process, improving reflective practice and critical thinking. In these environments, students can benefit from discussions initiated by other students and may also seek clarification with colleagues (Conrad & Dabbagh, 2018; Tan, 2017).

According to Revill and Terrell (2005), online discussion forums are well accepted by students and generally result in attractive, vibrant, and active discussions.

The ODF can encourage a more profound reflection than in a typical classroom situation, for are not necessary face-to-face encounters. That is because students have time to consider their responses and the posts of other students, leading to a more in-depth discussion and dialogical (AlJeraisy et al., 2015). Second Brito et al. (2011), one of the skills developed by the students in the forums, concerns the expansion of reasoning capacity and autonomy of students, that are built theme to theme. Besides that, the formation of autonomous learning groups makes forums a resource that goes beyond mediation since, due to its dynamism, its participants are not merely recipients of knowledge (Biondo, 2018; AlJeraisy et al, 2015).

According to Silva (2003), the interaction that takes place in the virtual environment provides the co-creation. Thus, online forums provide an environment for collaborative learning (Ting, 2013; Tan, 2006). Davis (2012) also noted that the forums could be used as social media too. Although these forums can provide students with social benefits, seldom instructors evaluate the posts of forum participants effectively (Nelson *et al.*, 2005).

Previous studies have shown that the use of Online Discussion Forums can have a positive effect on the academic achievement of students. (Biondo, 2018; AlJeraisy *et al.*, 2015; Wei Peng & Chou, 2015; Koole *et al.*, 2014; Jacob, 2012; Shana, 2009). From this perspective, Alghamdi (2013) concluded that the use of online discussion supplements the study in the classroom, and improves student achievement in higher education. Already AlJeraisy *et al.* (2015) investigated the impact of using online forums about student achievement at a private university, specifically in the Business Administration course. The authors have shown that students who participated in the forums had higher performance in exams.

## ASSESSMENT OF THE ONLINE DISCUSSION FORUMS

The benefits associated with the use of Online Discussion Forums in the education sector attracted the interest of many educators (Biondo, 2018). To improve the use of this tool, several researchers have developed diverse evaluation mechanisms for the forums. However, in the literature, there are two large approaches to assess the forums - a quantitative and other qualitative. Both methods have evaluation techniques that have positive and negative points (Cacheiro-Gonzalez *et al.*, 2019).

According to Nunes et al. (2014) and Shaul (2007), one of the primary methods of evaluation found in most online forums is the students' post count. In this method, students easily understand the measurement, and the task evaluation performed by tutors. However, there are also disadvantages, the forum topics may contain many insignificant posts that consist of little more than "agree" or "well said." Once the assessment, in this case, considers only the number of inserts, they are equally valued, regardless of content and form, and may cause dissatisfaction and lack of interest of some students. (Nunes et al., 2014; Shaul, 2007). Furthermore, as a result, the forum can become a receiver of fragmented messages and little bite articulated (Dennen, 2005). Like this, the forum as a collaborative learning tool may be underutilized (Dunlap, 2005).

Lee (2008) recommends the use of a peer evaluation system. According to the author, this method can be utilized for students to post their ideas, questions, and reflections. Then, the students can be read other messages and evaluate them according to the criteria predefined. In complement, that students can grade posted and monitor other forum participants. One benefit of this technique is that students learn while evaluating. When students are conducting the assessment, they are reading the posts of others, assimilating more content, and improving reading and writing skills (Lee, 2008). Cameron (2009) pointed out in their study that by including self-assessment activities and peer review, students become more aware of the evaluation criteria. Another approach is to form small collaborative groups of students who are responsible for one of the discussion topics (Tan, 2006; Barnes & Geer, 2001).

There are also other forms of subjective evaluations of the forums, such as writing style, initiative, the strength of argument and originality. These variables provide a useful reference for a robust classification system called a rubric. According to Biagiotti (2005), lines are explicit schemes for classifying products or behaviors in clear categories that aim to assess learning programs, provide formative feedback to students and serves as a reference for grading. For example, Edelstein and Edwards (2002) created a forum assessment rubric that includes five categories: Quickly and initiative; Postage delivery; Postage relevance; Expression within the postage; and Contribution to the Community Learning. Nandi, Chang and Balbo, 2009, after a consistent literature review, identified 12 criteria to evaluate the quality of the Online Discussion Forums, divided into three factors: (1) Content, (2) Quality and interaction; (3) Objective measures. Table 1 exemplifies the evaluation rubric of stretch. Note that ratings are based on a 1 to 4 scale.

**Table 1.** Evaluation rubric of stretch

| Category | Criterion | **1 - Bad** | **2 - Satisfactory** | **3 - Good** | **4 - Excellent** |
|---|---|---|---|---|---|
| Content | Justification | No justification for the points. | Justification based on personal opinion. | Justification using cases, concepts, or theories. | Justification using cases, concepts, or theories, fostering clear discussion of implications. |

*Note:* Adapted from Nandi, Chang and Balbo (2009).

In the qualitative assessment using rubrics, the time the educator spends in the process is a considerable disadvantage (Shaul, 2007). Consider the time to work all the criteria presented by Nandi, Chang and Balbo (2009). For example, a class of 20 students can easily post 100 to 300 messages in one forum. Thus, instructor fatigue easy, and it is worthy of concern because forum management is a significant activity whiff increases the intensity, time, and efforts necessary for excellent performance (Dunlap, 2005).

An alternative to the previous methods mentioned is data mining (Data Mining). Dringus and Ellis (2005) conducted one of the first research on the use of computer systems to evaluate Online Discussion Forums. They have developed tools to aid visualization of the data produced in the forums, including dates, contribution rate, and sequences of message exchanges. Data Mining is based on pre-processing routines and algorithms that allow you to discover the patterns and results of students in the activity. According to Souza and Perry (2019) and Feldman (2007), to extract relevant information, it is necessary to define essential characteristics in the forum discussions (eg., characters, words, terms, and concepts). Souza and Perry (2019) believe that data mining has significant potential to reveal hidden information. For example, one can first extract terms from the text, then adapt or normalize them, comparing them to a list of relevant topics (concepts), extracted through a categorization.

Regardless of the type and evaluation technique employed, a vital issue in the discussion forums online is that the assessment should be fair and reliable (McNamara & Burton, 2009). According to Kratochwill (2009), dialogical evaluation allows the teacher more than the simple monitoring of the process, but also the possibility of intervention and reflection on the action itself. Rebuilding their ways as well as enabling the learner to the reconstruction of his ideas as well.

For McNamara and Brown (2009), evaluation for the forum is a crucial indicator to show what and how students are grasping. For online discussion forums are more productive and facilitate learning, the forums need to be assessed appropriately. That means that the objective of the evaluation, the evaluation criteria, and the desired results should be established clearly and objectively. In this context, several authors conducted theoretical contributions on the subject, pointing out various quality factors for creating and managing Online Discussion Forums. Then, will be some principles for evaluating forums proposed by several researchers, are presented.

McLoughlin and Luca (2000), proposed nine categories for assessing online discussions: 1- Offer and receive assistance; 2 - Exchange resources and information; 3 - Explain and elaborate concepts; 4 -Share existing knowledge; 5 - Giving and receiving feedback; 6 - Criticizing the contributions of others; 7 - Monitor the contributions of each; 8 - Participate in collaborative tasks; 9 - Negotiate solutions to problems.

Wozniak and Silveira (2004) suggest a self-assessment in which students evaluate their contributions to the discussion. When students regularly record their perceptions of the contributions they are making to the exchange of ideas, they learn a huge amount of situations and behaviors that make productive discussion (Brookfield & Preskill, 1999). Following this logic, Wosniak and Silveira (2004) suggest that students select three posts that demonstrate some of the following three characteristics: i) The posting was appropriate for the group to be able to check your consistency before the expiry of the forum. ii) The post helped foster new interactions among students. iii) The posting fulfills its role in providing feedback to the group members.

A study developed by Knowlton (2001), contributes to the literature by proposing a model of four phases of self-analysis to evaluate the contribution in the student in a discussion of online forums. In step 1 it is verified how much each answer contributes to the discussion in the forum. In the second stage, responses are made available on the forum to expand the scope of the debate. In step 3, a summary of the discussion content should be written. In the last step, it is important to write a self-analysis of your role in the discussion. In the study by Mazzolini and Maddison (2007), students identified that tutors essential must-have characteristics in the mediation of forums, such as i) Question and accompany the answers one by one; ii) Introduce new concepts or new ways of thinking about solutions; iii) Answer the questions as quickly as possible; iv) Provide feedback; v) Discuss the solutions the students of different shapes and angles.

Graham et al. (2001) conducted a study that proposed seven principles for evaluating chats and tasks in online courses. The first concerns good contact practices and teacher-student communication. In this principle, the teacher must communicate clearly and objectively with the student. The second principle, reports on the importance of encouraging, promoting cooperation and discussion among students. The third principle focuses on supporting active learning. It happens through the development and presentation of projects and academic papers. The fourth principle of emphasis on good practice feedback, which should be fast, informative, and/or motivational. The fifth principle highlights the need to provide appropriate deadlines for the tasks online. The sixth principle, in turn, emphatically the importance of having challenging tasks and case studies. The last principle concerns the various forms of learning that enable students to choose topics several that can be incorporated into the course guidelines online (Graham et al., 2001).

In the work of McNamara and Brown (2008), the authors proposed some principles of evaluation for virtual environments of education. Such principles are used as the benchmark for the construction of the psychometric scale of this paper, which aims to evaluate Online Discussion Forums. These principles, advocated by McNamara and Brown (2008), can also be found in other studies, and are presented in Table 2 below.

**Table 2.** Principles of Evaluation of Online Discussion Forums proposed for McNamara and Brown (2008)

| Principles of Evaluation of Online Discussion Forums (McNamara and Brown, 2008) | Other Authors |
|---|---|
| Present and explain to the students the objectives of the online discussion forum as well as the learning advantages of the group. | Gaytan & McEwen, 2007; Graham et al. 2001 |
| Planning and organizing the forum with pre-structured topics to assist students in managing the discussion. | Vonderwell *et al.,* 2007 |
| The forum discussion topic should be directed with the help of activities and or primary and supplementary readings, and also with reflective issues addressed in the discussion. | Brooks and Jeong, 2005; Graham *et al.* 2001. |
| Tutors shall appropriately moderate the arguments in the forums. Students need to know that their participation in the forum is monitored and quality messages should be highlighted and valued. | Parks-Stamm Zafonte & Palenque, 2017; Klemm, 2000. |
| Specific evaluation criteria should be established in the forums (e.g., quantity and quality of the forum inserts, argumentation ability, correct writing, among others) | Salmon, 2002; Graham *et al.* 2001. |

*Note:* Developed by the authors (2021)

The purpose of this literature review was to provide information about the various formats and technics of evaluation of the online discussion forums. After this review identified in the literature, the lack of quantitative tools to assess the Online Discussion Forums from the student's perspective (user). In this context, the objective of this paper was to carry out a survey to fill this gap. The following describes the procedures and methods performed work for the construction and validation of the scale the measure of the Online Discussion Forums.

## METHODOLOGICAL APPROACH

The quantitative approach is used in this research to achieve the proposed objective. Quantitative analysis is characterized by objective test theories, analyzing possible relationships between the variables studied. Usually, the variables can be measured by instruments so that the data is processed using statistical techniques and interpreted by the researcher (Creswell & Clark, 2017).

The principles of evaluation of the Online Discussion Forums (ODF) proposed by McNamara and Brown (2008), constituted the primary theoretical basis of this studio. McNamara and Brown (2008) have developed a set of principles (parameters) and applied them in a discussion forum for law school students from Queensland University of Technology, in 2008, for two semesters. The authors concluded that the forum, to follow the principles proposed, was well accepted by the students and contributed to the creation of a collaborative learning environment. Thus, in this study, the principles were transformed and adapted into seven affirmatives, to evaluate the quality of the forums from the perspective of students.

In the next step, were consulted researchers with experience in the construction of psychometric scales to see if the scale items measure what you want to measure. Then, the questionnaire was built, being the type self-managed and consists of seven items. Was measurement the degree of agreement of respondents, it was used a Likert-type concordance scale of 10 points, where the first point corresponds to "Strongly Disagree" and the tenth point "Strongly Agree".

The survey sample was formed by a group of students who graduate broad sense the distance in various areas of a Brazilian Federal University. A filter question was used to collect the data. Thus, in this research participated only students who used the tool "Discussion Forum Online" as one of the course evaluation instruments. The questionnaire was developed in the Google Docs platform, which generated an access link. This link was sent to participants via email through the Google Docs forms shipping manager. The sample consisted of 128 respondents. This sample its type non-probabilistic for convenience.

The sample was divided into two, the first sample it is was used in the exploratory factor analysis, which included 64 respondents. According to the principles of Hair et al. (2018) and Tabachnick Fidell (2013), the authors suggest a higher sample of 50 observations for this type of statistical analysis. In the case of this study, we used the opinions of 64 students with 9 cases ratio for each variable. Likewise, the second sample of the 64 participants was used in confirmatory factor analysis. This sample also meets the recommendations of Hair et al. (2017) and Tabachnick Fidell (2013), which suggests that larger samples than 50 for tests with Structural Equation Modeling based Partial Least Square (PLS-SEM). This type of test does not require large samples and does not establish data normality assumptions (Ringle, Silva & Bido, 2014).

For the analysis of the data was used the statistical software BioEstat 5.0, which made it possible to treat the data as mean, frequency, standard deviation, and variance. Exploratory factor analysis and confirmatory were used SPSS 20.0 and 2.0 SmartPLS M3 (Ringle, Wende and Will, 2005). The SmartPLS software was used in this paper because it caters well to a variety of restrictions on research relates to Applied Social Sciences. For example, investigations that have few data and 'exploratories models' with little theoretical support. This technic was enabling better forecasting and development of the theory (Hair, Ringle & Sarstedt, 2011). The search results are presented below in the next session.

## RESULTS AND DISCUSSION

### Description of the Participants

After sending the questionnaire via Google Docs, we obtain 128 respondents in 10 days. The sample was composed of 31 women and 33 men, aged 17 to 25 years (10.9%) of 26 and 35 years (56.3%), 36 to 45 years (18.8%), and above to 46 years (14.1%). The duration of the courses carried out by respondents was 3 to 12 months (57.8%) and 13 to 24 months (42.2%). Also, of the total participants, 73.4%, consider the ODF a good teaching-learning tool against 26.6% who disagree.

## Exploratory Factor Analysis

The first stage was the statistical test based on Exploratory Factor Analysis (CFA). At this moment, was verify the sphericity of Bartlett and Kaiser Meyer-Olkin (KMO) criterion. KMO values between 0.7 and 0.8 are considered as good (Malhotra et al., 2017). In this work, the KMO criteria are accepted because it is obtained a value of 0.84. Already the Bartlett sphericity test assesses the extent to which the matrix of (co) variance is similar to a matrix-identity (Field, 2017). Concerning the Bartlett test, its indicator was significant at 0.000, demonstrating that it is appropriate for the use of factor analysis.

A criterion to be observed to retain an adequate number of factors criterion is the Kaiser-Guttman and its representation of the explained total variance. In CFA, the explained variance refers to the portion of common variance, on the one factor or a set of factors, gat extracted from a given set of data (Hair et al., 2018). With the near eigenvalue 1 and total variance explained 79.78% of the data, it was found two factors from the data significative. It should be noted that the commonalities of the variables were observed. According to the literature, the commonalities should have values above 0.5 (Malhotra, 2020). The analysis of the commonalities of this research found values greater than 0.8 for all variables.

At that moment, the factor rotation method will be applied, which aims to facilitate the interpretation of the factors, since the variables analyzed often have high factor loads in more than one factor. The aim of factor rotations is, therefore, to find a simple solution and interpretable possible, in which each variable present a high load factor in a few factors, or only one (Damasio, 2012). The rotation method chosen was oblique, because, according to Field (2017), this method assumes that there is a correlation between the factors. In the method Oblimin Direct, the degree of correlation of the factors is determined by the value of a constant called Delta (Δ). The default value is zero, and this ensures that a high correlation between the factors is not permitted.

**Table 3.** Factor analysis based on Direct Matrix Rotated Oblimin of the Quality Perception of Online Discussion Forums.

| items | Variables | Factor 1 | Factor 2 |
|---|---|---|---|
| Q1 | During the distance course, the online discussion forums presented and made clear what their goals were. | 0.881 | - |
| Q2 | The evaluation criteria (scores) of the online discussion forums were well established and clear. | 0.882 | - |
| Q3 | The online discussion forums were well planned and organized with pre-structured topics to assist you. | 0.887 | - |
| Q4 | The online discussion topics were directed with the help of readings or activities, as well as reflective questions. | 0.803 | - |
| Q5 | The tutors adequately moderated discussions in the online forums. | - | 0.847 |
| Q6 | As a participant in the online discussion forums, you felt that the tutors were monitoring you. | - | 0.908 |
| Q7 | The evaluation criteria (scores) of the online discussion forums were well established and clear. | - | 0.938 |

**Source:** Research data.

When analyzing Table 3, it is possible to verify that the first four variables have higher factor loads in Factor 1, these loads are greater than 0.8 giving robustness to the factor. The last three variables have a higher factor load in Factor 2, and they also have factor loads greater than 0.8. Because the factors are well defined, at that moment, a nomination of each factor will be proposed, according to their unique characteristics. Factor 1 was named the "Forum Structure" because the variables that comprise it are evaluating how the forums are planned and organized. The second factor was named the "Forum of Mediation" because it involves the educator tutorials activities with students. The formation of these factors are consistent and congruent with the theory proposed by Parks-Stamm Zafonte and Palenque, (2017), McNamara and Brown (2008), Gaytan and McEwen (2007), Vonderwell et al., (2007), Graham et al. (2001).

## Confirmatory Factor Analysis

In the step of the paper was the application of Confirmatory Factor Analysis (CFA), which aims to verify whether the data observed behave in accordance with the theory. The CFA serves as positive evidence for data validation and strengthens the theory studied. If there is no positive validation, the analysis makes it possible to identify possible problems with the data, with the theory, or with both (Malhotra, 2020; Spider & Zambaldi, 2008).

In complement, the CFA, the Structural Equation Modeling based on the PLS-SEM Partial Least Squares performs the Confirmatory Factor Analysis (CFA). It thereby is possible the adjustment between the observed data and a hypostatized model (Hair et al. 2017). In this type of analysis technique, the factorial load of the latent construct mediation items is explicitly specified in the structural model. Then, the adjustment of this pre-specified model is examined to determine its convergent and discriminating validities (Malhotra et al., 2017; Gefen & Straub, 2005; Straube, Boudreau & Gefen, 2004). In the CFA the researcher must specify the number of factors/constructs that exist within the data set (Hair et al. 2018). In this study, two constructs were identified in the CFA.

Following the guidance of Hair et al. (2018), the two dimensions identified in the CFA were introduced in the structural model. Thus, the Quality Perception of Online Discussion Forums (QPODF) construct can be better understood when its variables are divided into two constructs: (1) Forum Structure and (2) Forum Mediation. In this way, the measurement model can be seen in Figure 1, which illustrates a reflective model with two first-order constructs and their indicators.

Based on Figure 1, it is possible to verify the dependence relationships between the variables (Q1, Q2 ... Q7) with the constructs. The arrows describe the impact of one construct on the other, which demonstrates the dependency relationships, the cause and the effect (Malhotra, 2020). To have an adjusted model, the variables of the Forum Structure and Forum Mediation constructs must have factorial loads (l) greater than 0.6, according to the guidance of Anderson and Gerbin (1988). When looking at Figure 1, it is possible to note that the factorial loads (l) are greater than 0.7, indicating that the model is adjusted and fit for the other tests.

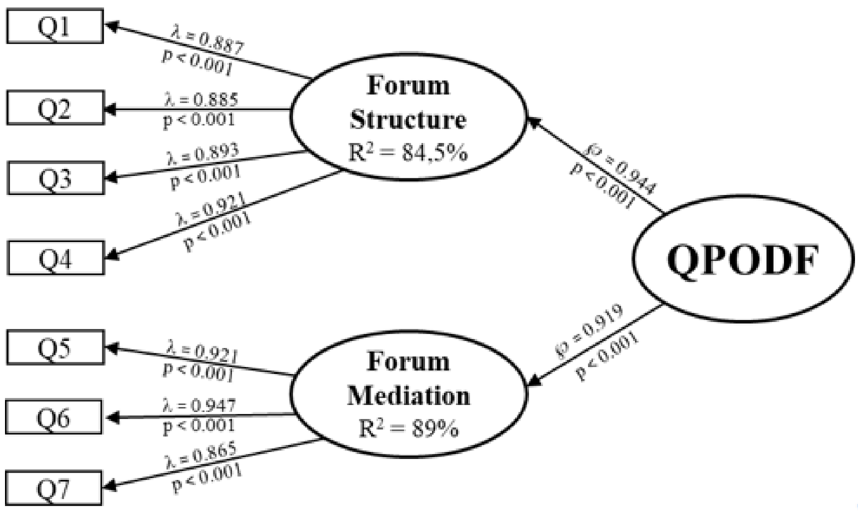


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**Figure 1.** Measurement model and structural construct of the Quality Perception of Online Discussion Forums

Similarly, it is important to verify the robustness of the structural model, for this, the path coefficient (℘) is analyzed and also the existence of significance (ɑ) of the values ℘, that represent the relationships between the constructs. The ℘ connecting the first-order constructs to the QPFDO construct have loads greater than 0.6, indicating a strong relationship. Through the Bootstrapping test, it's possible to verify is loads of the coefficients of the model paths. Therefore, all relationships found in the model are significant with ɑ < 0.001, meeting the recommendations of Hair et al. (2018).

The next step is to perform the Reliability and Convergent Validity test of the structural model. The Cronbach's Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE) are necessary to verify the reliability of the model. Cronbach's Alpha is the measure most used as a reliability indicator because it checks the correlations of a set the variable (Hair et al., 2018). According to Nunnaly (1978), the CA varies from 0 to 1, with the range of values from 0.60 to 0.70 being considered the lower limit of acceptability. Composite Reliability is used to assess whether the sample is error-free, or whether the responses, taken as a whole, are reliable. In exploratory research, values of 0.70 and 0.90 of CC are considered satisfactory (Hair et al., 2017).

**Table 4.** Indicators of quality adjustment of the measurement model

| Constructions | [a]AVE | [b]CR | [c]$R^2$ | [d]CA |
|---|---|---|---|---|
| QPODF | 0.670 | 0.930 | - | 0.920 |
| Forum Structure | 0.730 | 0.910 | 0.890 | 0.880 |
| Mediation Forum | 0.830 | 0.930 | 0.840 | 0.890 |

*Notes:* This table is depicted values that attest to the quality of fit of the model. The indicator aAVE -Average Variance Extracted, bCR - Composite Reliability, c$R^2$ - Pearson's determination coefficients, and dCA Cronbach's Alpha.

**Source:** Research data.

The Convergent Validity verifies the correlation between two measures of the same structural model. She confirms that the scale used is correlating with other scales of the proposed theoretical model (Malhotra et al. 2017; Pasquali, 2007). Convergent Validity can be obtained through the Average Variance Extracted (AVE). Therefore, Fornell and Larcker indicate that the AVEs must have values greater than 0.50. Thus, when the indicator is greater than 0.50, the model converges to an acceptable result (Fornell & Larcker, 1981). Through Table 4, it can be seen that the model in this paper met the assumptions of reliability and convergent validity suggested in the literature.

At that moment, Pearson's determination coefficients ($R^2$) are analyzed. The $R^2$ represents the portion of the variance of the endogenous variables, which is explained by the measurement model. In other words, high $R^2$s indicate that the model is adjusted and of quality (Ringle, et al., 2015). For social and behavioral sciences, Cohen (1988) suggests that $R^2 = 2\%$ is classified as a small effect, $R^2 = 13\%$ as a medium effect, and $R^2 \geq 26\%$ as a large effect. Through Figure 1 and Table 2, it is possible to verify that the constructs, Forum Structure, and Forum Mediation, have high $R^2$ (89% and 84%, respectively). These values demonstrate that the variables that comprise them significantly explain the phenomenon studied, confirming a quality adjustment of the structural model studied.

One of the ways to verify the discriminant validity is through the criteria of Fornell and Larcker (1981). Second Hair et al. (2018), discriminant validity ensures that the scale is sufficiently different from other similar concepts and so be distinct. This criterion is obtained by comparing the square roots of the AVE values of each construct with the correlations between the constructs (or latent variables). Thus, the square roots of the AVEs must be greater than the correlations between the constructs. Analyzing Table 5, it is possible to prove the Discriminating Validity between the constructs, that is, the Forum Structure and Forum Mediation constructs are measuring different concepts. At the same time, they give rise to the Quality Perception of Online Discussion Forums (QPODF) construct, as shown in Figure 1.

**Table 5.** Discriminant validity of the measurement model of the Quality Perception of Online Discussion Forums

| **Constructs** | Structure Forums | Mediation Forums |
|---|---|---|
| Structure of Forums | **0.85 *** | - |
| Forums mediation | 0.73 | **0.91** |

*Note:* * Bold values (diagonal) is the square root of the AVEs, the other value is the Pearson correlation between the two constructs.

**Source:** Research data.

After carrying out the tests above, it was found a good adjustment of the measurement model and, consequently, the validation of the QPODF scale. In this sense, it is also possible to say that QPODF is a second-order construct, being better understood and explained by two first-order constructs (Forum Structure and Forum Mediation). It is worth mentioning the correct choice of the oblique rotation method in the Exploratory Factor Analysis, as it is possible to see in Table 3 the strong positive correlation (r = 0.73) between the two constructs.

## COMPLEMENTARY DISCUSSION OF RESULTS

The research results will be discussed from two perspectives. First, an analysis is made from a theoretical perspective, and secondly, a reflection is given on the psychometric assumptions in relation to the construction and validation of scales. Regarding the theory, it was clear that several presuppositions help determine the quality of the Online Discussion Forums (ODF) (Nandi, Chang & Balbo, 2009; McNamara & Brown, 2008; McLoughlin & Luca, 2000; Wozniak & Silveira, 2004; Graham, et al., 2001). However, there has been no interest on the part of researchers to validate their proposals using robust quantitative models and techniques that provide a better understanding of this phenomenon. Therefore, the results of this work inaugurate a particularly exciting line of research, since it places the user of the forum, in this case, the student, as a central element of the ODF evaluation process. Also, the study demonstrated that the quality of the ODF is better understood from two dimensions: Forum Structure and Forum Mediation.

As for the psychometric assumptions, it is essential to note that the theoretical approach used to develop the scale, was adequately suited for the validation of the measurement model. Thus, the dimensionality of the QPODF construct underwent the scrutiny of multivariate analyzes to support the theory, possibility the scale's validation. The two factors identified proved to be consistent and accurate in assessing the quality of online forums. Also, The tests performed obtained robust results meeting the various criteria for scale validation, proposed by several researchers (Thielmann & Hilbig, 2019; Pasquali, 2007; Nunnaly, 1978)

The results validate a new proposal for evaluating the forums based on the students' attitudes towards structure and mediation. These findings can potentially impact the quality of collaborative learning. In this way, managers can identify whether the teaching-learning tool ODF is underutilized. When using the scale, educators can verify that the forums have been well designed, planned, and organized. Mainly, to identify if the online instructors are interacting correctly with the students, either asking, introducing new concepts to the debate, responding quickly, providing feedback. Finally, developing good practices that encourage interaction and collaborative learning.

## FINAL CONSIDERATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Online Discussion Forums (ODF) are essential tools in distance learning modalities. This work sought to present a new tool that makes it possible to evaluate the effective use of the forum. In this sense, the objective of the study was to develop a measurement scale that would assess the perceived quality of ODF from the students' perspective. The scale's validity was considered consistent and robust. The results of the factor analysis of this study confirm the theoretical assumptions of McNamara and Brown (2008) and Graham et al. (2001). Thus, the QPODF construct also proved to be a valid and accurate measure. The seven items of the proposed scale, have robust and significant factor loads. The tests of reliability and validity reinforced the accuracy of the instrument QPODF. The scale items were theoretically consistent, the two factors obtained (Forum Structure and Forum Mediation) are in line with the theoretical basis of McNamara and Brown (2008) and Graham et al. (2001).

Despite the good QPODF indicators presented in this work, future studies must be carried out. It is suggested that in new investigations, other scales should be developed using different theoretical bases (Mazzolini & Maddison, 2007; Wozniak & Silveira, 2004; Knowlton, 2001; McLoughlin & Luca, 2000). With this, it is possible to carry out comparative tests between the QPODF scale and the new scales. It is also recommended that further research propose other items on the QPODF scale, further refining the measurement instrument. Finally, it is suggested that the QPODF construct be integrated into other structural models. The construct must be tested as an antecedent of different constructs, such as, for example, school performance, student satisfaction, or perceived quality of the course.

Finally, it is expected that the work will contribute to the academy by increasing the scope of works involving this theme. Another perspective for a user on the QPODF scale is its utility as an educational management tool. In this sense, it can be used by several courses aimed at distance education. That makes it possible to check if your forums are adequate. Furthermore, verifying some fundamental principles for a better evaluation of students. As a final result, it is expected that supervisors and tutors when using this new tool (QPODF), can contribute to the construction of collaborative knowledge in an online environment that makes use of the discussion forums

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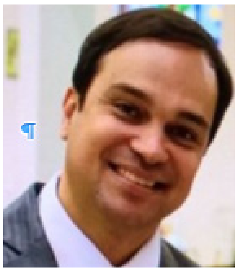

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## REFERENCES

Alghamdi, A. (2013). Pedagogical implications of using discussion board to improve student learning in higher education. *Higher Education Studies, 3*(5), 68-80.

AlJeraisy, M. N., Mohammad, H., Fayyoumi, A., and Alrashideh, W. (2015). Web 2.0 in education: The impact of discussion board on student performance and satisfaction. *The Turkish On-line Journal of Educational Technology, 14*(2), 247-259.

Alzahrani, M. G. (2017). The Effect of Using On-line Discussion Forums on Students' Learning. *Turkish On-line Journal of Educational Technology-TOJET*, *16*(1), 164-176.

Anderson, J., & Gerbin, D. (1988). Structural equation modeling in practice: a review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411-423.

Andresen, M. A. (2009). Asynchronous discussion forums: Success factors, outcomes, assessments, and limitations. *Educational Technology and Society, 12*(1), 249-257.

Aranha, F., & Zambaldi, F. (2008). *Analise fatorial em administracao.* Cengage Learning.

Biagiotti, L. C. B. (2005). *Conhecendo e aplicando rubricas em avaliacões*. In Congresso Brasileiro de Educacao a Distância**.** 01-09.

Biondo, F. P. (2018). Papéis de professor e de aluno em foruns on-line de língua portuguesa. *Acta Scientiarum. Language and Culture*, *40*(1).

Blackmon, S. J. (2012).Outcomes of chat and discussion board use in on-line learning: A research synthesis. *Journal of Educators On-line*, *9*(2).

Brito, J. A., Melo Filho, I. J., Carvalho, R. S., Melo, R. M., & Gomes, A. S. (2011). Interfaces colaborativas para atividades assíncronas em forum de discussao. In *Anais do Simposio Brasileiro de Informatica na Educacao. 1*(1).

Brookfield, S., & Preskill, S. (1999). *Discussion as a way of teaching:* Tools and techniques for university teachers. McGraw-Hill Education.

Brooks, C. D., & Jeong, A. (2006). Effects of pre-structuring discussion threads on group interaction and group performance in computer-supported collaborative argumentation. *Distance Education*, *27*(3), 371-390.

Cacheiro-Gonzalez, M. L., Medina-Rivilla, A., Dominguez-Garrido, M. C., & Medina-Dominguez, M. (2019). The Learning Platform in Distance Higher Education: Student's Perceptions. *Turkish Online Journal of Distance Education*, *20*(1), 71-95.

Cameron, L. (2009). Assessing on-line discussions and forums. In: *Proceedings of the 2009 European LAMS and Learning Design Conference:* Opening up Learning Design. Sydney.

Chang, C. K., Chen, G. D., & Hsu, C. K. (2011). Providing adequate interactions in on-line discussion forums using few teaching assistants. *The Turkish On-line Journal of Educational Technology***,** *10*(3), 193-202.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences***.** 2th ed. New York: Psychology Press.

Conrad, S. S., & Dabbagh, N. (2018). Student and instructors perceptions of helpful feedback for asynchronous online learning: What students want from instructor feedback. In *Innovative applications of online pedagogy and course design* (pp. 177-201). IGI Global.

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage Publications, California.

Damasio, B. F. (2012). Uso da analise fatorial exploratoria em psicologia. *Aval. psicol.*, Itatiba, *11*(2).

Davis, P. (2012). On-line forums: The forgotten social media platform. *The Playbook*, *10*.

Dennen, V. P. (2005). From message posting to learning dialogues: Factors affecting learner participation in asynchronous discussion. *Distance Education*, *26*(1), 127-148.

Dringus, L. P., & Ellis, T. (2005). Using data mining as a strategy for assessing asynchronous discussion forums. *Computers and Education*, *45*(1), 141-160.

Dunlap, J. C. (2005). Workload reduction in on-line course: Getting some shuteye. *Performance Improvement, 44*(5).

Edelstein, S., & Edwards, J. (2002). If you build it, they will come: Building learning communities through threaded discussions. *On-line Journal of Distance Learning Administration, 5*(1).

Ellis, R. (2005). Principles of instructed language learning. *System*, *33*(2), 209-224.

Feldman, R., & Sanger, J. (2007). *The Text Mining Handbook:* Advanced Approaches in Analyzing Unstructured Data. Cambridge, MA: Cambridge University Press.

Field, A. (2017). *Discovering statistics using IBM SPSS statistics***.** 5th ed. SAGE Publications Ltd.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*, 39-50.

Gaytan, J., & Mcewen, B. C. (2007). Effective on-line instructional and assessment strategies. *The American Journal of Distance Education*, *21*(3), 117-132.

Geer, R., & Barnes, A. (2001). E-mail discussion and student learning outcomes: A case study. *International Educational Journal, 2*(4).

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information systems*, v. *16*(1), 5.

Graham, C., Cagiltay, K., Lim, B. R., Craner, J., & Duffy, T. M. (2001). Seven principles of effective teaching. *The Technology Source*, *30*(5), 50.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2018), *Multivariate Data Analysis*. 8th ed., Cengage Learning EMEA.

Hair, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2017), *A primer on partial least squares structural equation modeling (PLS-SEM).* 2th ed. Sage Publications.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice*, *19*(2),139-152.

Hair, J. F., Sarstedt, M., Ringle, C. M. & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science***,** *40*(3), 414–433.

Hulkari, K., & Mahlamäki-Kultanen, S. (2008). Reflection through web discussions: Assessing nursing students' work-based learning. *Journal of Workplace Learning*, *20*(3), 157-164.

Jacob, S. M. (2012). Mathematical achievement and critical thinking skills in asynchronous discussion forums. *Procedia - Social and Behavioral Sciences, 31*, 800-804.

Klemm, W. R. (2000). What's Wrong With On-line Discussions - And How To Fix It., In *Gordon Davies and Charles B. Owen*. WebNet, AACE, 335-340.

Knowlton, D. (2001). Promoting durable knowledge constructions through on-line discussion. In *Proceedings of the Annual Mid-South Instructional Technology Conference.* 6th ed., Murfreesboro,Tennessee.

Koole, S., Vervaeke, S., Cosyn, J., & Bruyn, H. (2014). Exploring the relation between on-line case-based discussions and learning outcomes in dental education. *Journal of Dental Education***,** *78*(11), 1552-1557.

Kratochwill, S. (2009). Avaliacao da aprendizagem em uma perspectiva dialogica a partir do forum on-line. In *Aprendizagem em ambientes virtuais e educacao a distância*. Porto Alegre: Mediacao, 135-168.

Lee, S. J. (2008). Designing a Peer Rating System for Asynchronous discussion. *Association for Educational Communications and Technology*: Estados Unidos, 413-417.

Malhotra, N. K. (2020). *Marketing research:* An Applied Orientation. 8th ed. Pearson Education.

Malhotra, N., Nunan, D. & Birks, D.F. (2017), *Marketing Research:* An Applied Approach, 5th ed., New York: Pearson.

Mazzolini, M., & Maddison, S. (2007). When to jump in: The role of the instructor in on-line discussion forums. *Computers and Education*, *49*(2), 193-213.

McLoughlin, C., & Luca, J. (2000). Cognitive engagement and higher order thinking through computer conferencing: We know why but do we know how? *Flexible futures in tertiary teaching:* Proceedings of the 9rd Annual Teaching Learning Forum, 2-4.

McNamara, J., & Brown, C. (2008). Assessment of collaborative learning in on-line discussions. *ATN Assessment*, *1*(1).

McNamara, J., & Brown, C. (2009). Assessment of on-line discussion in work-integrated learning. *Campus-Wide Information Systems*, *26*(5), 413-423.

McNamara, J., & Burton, K. (2009). Assessment of on-line discussion forums for law students. *Journal of University Teaching and Learning Practice*, *6*(2), 6.

Nandi, D., Chang, S., & Balbo, S. (2009). A conceptual framework for assessing interaction quality in on-line discussion forums. *Same places, different spaces***.** Proceedings ascilite Auckland, 665-673.

Nelson, M., Bhagyavati, M. G., Settle, A., Shaffer, D., & Watts, J. (2005). On-line teaching practices (both best and worst). Panel discussion. *Journal of Computing Sciences in Colleges*, *21*(2). 14.

Nunes, B. P., Kawase, R., Fetahu, B., Casanova, M. A., & de Campos, G. H. B. (2014). Educational forums at a glance: Topic extraction and selection. In *International Conference on Web Information Systems Engineering*. 351-364.

Nunnaly, J. C. (1978). *Psychometric theory.* New York: McGraw-Hill Book.

Parks-Stamm, E. J., Zafonte, M., & Palenque, S. M. (2017). The effects of instructor participation and class size on student participation in an online class discussion forum. *British Journal of Educational Technology*, *48*(6), 1250-1259.

Pasquali, L. (2007). Validade dos testes psicologicos: sera possível reencontrar o caminho. *Psicologia:* Teoria e Pesquisa, *23*, 99-107.

Revill, G., & Terrell, I. (2005). Learning in the workplace: A new degree on-line. *Innovations in Education and Teaching International*, *42*(3), 231-245.

Ringle, C. M., Wende, S., & Will, S. (2005). *SmartPLS (*versao 2.0 M3 Beta) [Software]. Hamburg: SmartPLS.

Ringle, C. M. Silva, D., & Bido, D. S. (2014). Modelagem de equacões estruturais com utilizacao do SmartPLS. *REMark, 13*(2), 54.

Salmon, G. (2002). *E-tivities:* The Key to Active On-line Learning. RoutledgeFalmer, London.

Sanchez, L. P. (2005). El foro virtual como espacio educativo: propuestas didacticas para su uso. *Verista Quaderns Digitals Net*, *40*,1-18.

Shana, Z. (2009). Learning with technology: Using discussion forums to augment a traditional-style class. *Journal of Educational Technology and Society, 12*(3), 214-228.

Shaul, M. (2007). Assessing on-line discussion forum participation. *International Journal of Information and Communication Technology Education*, *3*(3), 39-46.

Silva, M. (2003). *Educacao on-line:* teorias, praticas, legislacao, formacao corporativa. Sao Paulo: Edicões Loyola.

Souza, V. F., & Perry, G. T. (2019). Mineracao de Texto em Moocs: Analise da Relevância Tematica de Postagens em Foruns de Discussao. *RENOTE-Revista Novas Tecnologias na Educacao*, *17*(3), 204-213.

Straub, D., Boudreau, M. C., & Gefen, D. (2004). Validation guidelines for IS positivista research. *Communications of the Association for Information systems*, *13*(1), 24.

Tabachnick, B., & Fidell, L. (2013). *Using multivariate analysis*. 6rd. Pearson Education.

Tan, C. K. (2006). The implementation of an online discussion board for collaborative learning. *Online teaching and learning in ELT*, 111-131.

Tan, K. E. (2017). Using online discussion forums to support learning of paraphrasing. *British Journal of Educational Technology*, *48*(6), 1239-1249.

Thielmann, I., & Hilbig, B. E. (2019). Nomological consistency: A comprehensive test of the equivalence of different trait indicators for the same constructs. *Journal of personality*, *87*(3), 715-730.

Ting, L., Mansor, W. F. A. W., Zakaria, M. H., & Deris, F. D. (2013). On-line Discussion Behavior Within Collaborative Learning Via E-Forum. *Jurnal Tekenologi* (Social Sciences), Skudai (Malasia), *65*(2), 67-74.

Vonderwell, S., Liang, X., & Alderman, K. (2007). Asynchronous discussions and assessment in on-line learning. *Journal of Research on Technology in Education*, *39*(3), 309-328.

Wei, H. C., Peng, H., & Chou, C. (2015). Can more interactivity improve learning achievement in an on-line course? Effects of college students' perception and actual use of a course-management system on their learning achievement. *Computers and Education, 83*, 10-21.

Wozniak, H., & Silveira, S. (2004). On-line discussions: Promoting effective student to student interaction. In R. Atkinson, C. McBeath, D., Jonas-Dwyer and R. Phillips (Eds), *Beyond the comfort zone: Proceedings of the 21st ASCILTIE Conference, Perth, 5-8 December.* 956-960.

Xia, J., Fielder, J., & Siragusa, L. (2013). Achieving better peer interaction in on-line discussion forums: A reflective practitioner case study. *Issues in Educational Research, 23*(1), 97-113.

# INNOVATIVE APPROACHES IN DEVELOPMENT OF EDUCATIONAL MATERIALS: A CASE STUDY OF SCIENCE TEACHERS

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## ABSTRACT

This study aims to examine experiences of science teachers in the training process they attended for innovative technology applications. Case study method, one of the qualitative research methods, was used for study design. 35 science teachers, who work in public schools affiliated to Ministry of National Education in seven regions of Turkey have participated in the study. In determining the participants, maximum variation and criterion sampling methods from the purposeful sampling methods were used. In the research, teachers were provided with training on innovative technology applications for a week period. Data collection tools used in the research were the reflection form developed by the researchers, daily activity evaluation forms and e-portfolios. The data was analyzed applying content analysis technique. Regarding the findings, teachers found innovative technologies positive in terms of attracting student attention, increasing involvement of the students, and facilitating/concretizing learning; and negative in terms of causing distraction and technology dependence. Regarding the results obtained from e-portfolios, participants produced concrete or digital products involving making a spacecraft, making Virtual Reality (VR)lasses, constructing hologram pyramid, creating picture holograms and video holograms. In addition, the participants emphasized that they mostly had positive opinions about the training they have attended, they encountered difficulties in Unity software, they plan to include innovative technology applications in science education especially in teaching astronomy and space concepts, they suggested stakeholders increasing the trainings given by experts and applied professional development activities.

**Keywords:** Science education, augmented reality, virtual reality, digital holography, innovative technologies.

## INTRODUCTION

The increase in the use of technology in education and training processes has enhanced its role in education and has made the use of technological tools indispensable in learning environments as in all areas of our lives. In the digital age we live in, it is inevitable for technological tools to change and evolve. In addition to the hardware tools such as computer, projection, tablet, smart board, and software such as PowerPoint, educational software, animations, simulations, various settings and tools that differ in terms of both hardware and software are being used in the classroom setting.

Students have sometimes difficulties with understanding abstract visualisations even if they are presented in 3D space. The problem is how to decrease the gap between the real world which surrounds us and the abstract models which are used in simulations (Zagoransk & Divjak, 2003). Since there are more abstract concepts in science, it is thought that innovative technology applications will be particularly effective in teaching subjects or concepts, as they appeal to more than one sense. In this context, this study is planned to be carried out with science teachers who have different characteristics.

We see augmented reality, virtual reality and hologram technologies, which can be called as innovative technologies, among the most popular tools and settings. As in many fields such as health, defense, communication, marketing and tourism, the applications developed with these technologies are also becoming widespread in the field of education. Regarding the applications developed in recent years, especially mobile applications, accessible innovative technology applications that teachers can use on their own are observed to highly increase. Virtual, blended and augmented reality applications offer a rich learning environment to the learner using interactive, collaborative, creative, problem-solving based learning approaches. In this respect, in a learner-centered approach virtual, blended and augmented reality applications can be used as auxiliary material in education and training (Orhan & Karaman, 2011). Within the scope of this research, we focused on augmented reality, virtual reality and hologram technologies because of their potential for use in science education.

## Innovative Technologies

In this study, Augmented Reality, Virtual Reality, and Digital Hologram technologies are considered as innovative technologies. Thus, these technologies are meant by innovative technologies in this study. We start with the literature on these technologies.

Augmented reality is defined as the technologies that enable the users to see improved or enhanced version of the world with the help of textual, audio-visual, etc. information (Gonzato, Arcila, & Crespin, 2008). The most prominent feature of augmented reality technology is using virtual objects in the real-world setting, enriching them with virtual objects such as pre-designed images, sound, video or animation. In this way, the real-world setting is enriched with virtual objects, in other words augmented. We can see the term augmented reality as enlarged reality, enriched reality, enhanced reality or supported reality in the literature (Ozarslan, 2013). In augmented reality technology, the communication is established via augmented reality application, by receiving information from real world through sensors (Craig, 2013). Many hardware and software used by augmented reality systems are also used by other technologies. However, the distinctive feature of augmented reality is the seamless integration of virtual objects into a real context (Billinghurst, Kato, & Poupyrev, 2001; Chang, Morreale, & Medicherla, 2010). Use of Augmented Reality (AR) applications in education was observed to have positive effects on the learning process by facilitating the understanding of the concepts (Chen & Tsai, 2012; Kaufmann & Schmalstieg, 2003; Klopfer & Squire, 2008); concretizing abstract concepts (Chang et al., 2015; Huang, Chen, & Chou, 2016; Lin, et al., 2013; Sommerauer & Muller, 2014; Tsai, Liu, & Yau, 2013); attracting and increasing student's attention (Chang et al., 2014; Di-Serio, Ibanez, & Kloos, 2013; Hsiao & Rashvand, 2011; Ibanez, Di-Serio, Villaran-Molina, & Delgado-Floos, 2014; Hsu, 2015; Lin et al., 2013; Wojciechowski & Cellary, 2013; Yildirim, 2020), increasing student motivation (Di-Serio et al., 2013; Klopfer & Squire, 2008; Yildirim, 2020), and increasing the willingness to learn (Chen & Tsai, 2012; Wojciechowski & Cellary, 2013).

Virtual reality (VR), on the other hand, is a simulated experience that may look like the real world or may be completely different from the real world. Technically, virtual reality is used in computer-based 3D settings where individuals experience the feeling of being there. Users get into the virtual settings through various peripherals (helmeted screens, etc.) ("Virtual reality," 2021). Since the moment he/she enters into the setting, the user is disconnected from reality and completely lives the feeling of being in the setting created by virtual reality. Virtual reality is a fully artificial digital setting that uses computer hardware and software to create the look of a real setting for the user (Kipper & Rampolla, 2013). Yildirim, Elban and Yildirim (2018) emphasized that VR applications are effective in increasing students' interest towards the course by giving them the feeling of being in a setting even though they are not physically present there. In addition, there are studies reporting that VR applications will help students understand better and the acquired knowledge to be permanent by allowing physical investigation of the objects that are not actually accessible (Freina & Ott, 2015). In this study, no classification is done in terms of reality. We handle AR, VR and Digital Hologram as innovative technologies.

Another innovative technology, digital hologram, is one of the imaging tools. It is a 3-dimensional image, created by a holographic projection from a consistent light source, such as laser (Sudeep, 2013). There are three popular types of holograms, namely reflection, transmission, and computer-generated holograms. Each hologram type has its own characteristics and its use depends regarding the object to display (Barkhaya & Halim, 2016). 3D (3-dimensional) Hologram works by creating an illusion of a 3-D image. To generate illusions, first, a light source is focused on the surface of an item and the light is scattered. Meanwhile, a second light source is used to spread the same item and thus create an image between both light sources. This results in a connection between both light sources, causing a diffraction that gives an impression similar to 3D image (Ghuloum, 2010). There are findings showing that holograms are effective in students' concrete learning and support their thinking and problem-solving skills (School & Unver, 2016; Yamaguchi & Yoshikawa, 2012).

Augmented reality applications include applications such as Quiver, ATF Store (augmented reality cards), MikrosAR, Anatomy 4D (Abdusselam, Kilis, Sahin Cakir, & Abdusselam, 2018; Durak & Yilmaz, 2019; Erbas & Demirer, 2014), whereas virtual reality applications include applications such as SkyView, Google CardBoard, Solar System Scope, Inmind VR, Spacecraft 3D, Titans of Space (Arici & Aktamis, 2013; Dagdalan, 2019; Tepe, Kaleci, & Tuzun, 2016). Digital holograms, on the other hand, are not the kind of applications that can be installed on mobile devices, they are the technologies requiring the use of an apparatus such as a hologram pyramid and various computer software prior to the hologram generation.

## Studies on Educational Use of Innovative Technologies

Effective integration of innovative technologies is considered essential for the success of teaching activities (Caliskan, 2017; Koyunlu Unlu & Dokme, 2020). Augmented reality and virtual reality were observed to have an important place in innovative technology applications. According to Abdulselam (2014), laboratory settings created with augmented reality in physics instruction affect students' academic success and attitudes positively. Students generally stated that the applications performed with innovative technologies are fun, attractive and facilitate their learning (Caliskan, 2017).

The positive effects of AR technology on learning have been recognized in previous studies as the development of skills and knowledge, enriched learning experiences and improvement of cooperative learning (Wu, Lee, Chang, & Liang, 2013). Seo, Kim, and Kim (2006) tested the effect of AR between 9-12 years old students when they were learning volcanoes. The study compared the methods involving textbooks, AR under teacher control and AR under student control. The study showed that students learned significantly better under AR conditions, but no significant difference was observed between AR groups. Chen (2006) reported that students better understand chemical structures by using AR than textbooks. In the study of Sin and Zaman (2010), students learned the characteristics of the solar system through either textbook or AR. The pre-test scores of the students who used the textbook increased by 17%, while the pre-scores of the students using AR system increased by 46% and they reported higher comprehension of the concepts. However, there are significant obstacles for the successful use of augmented reality in the classroom, such as time and technical expertise regarding materials development (Kerawalla, Luckin, Seljeflot, & Woolard, 2006).

Virtual reality is widely used at several levels. It was used in many areas in a collaborative immersive system, from nurse training (Green, Wyllie, & Jackson, 2013), to medical virtual hospital training (Kleven, 2014), simulated pulling out decayed tooth exercises (Eve et al., 2014) for dentistry students. Research shows that virtual reality can play an important role in research activities and provides the opportunity to visualize and simulate the events that cannot be perceived in real life. In medical research, virtual reality allows not only visualization, but also the possibility of moving in neural tissue (Morehead et al., 2014). The CAVE VR system developed in another study is an application used to display magnetic fields in the solar system (Kageyama, 2013).

Studies on the use of 3D hologram technology in education show that holograms provide benefits in many areas. In his study, Monnin (2010) emphasized that 3D hologram technology can be an effective auxiliary learning technology for attracting the attention of children because of the free floating of the laser image in the air. Many studies underline that the 360-degree hologram enables students to observe the images of an object from different angles (Aina, 2010; Robin, 2013). In a meta-analysis conducted by Barkhaya and Halim (2016), 3-dimensional hologram was found to be an effective teaching tool in attracting students' attention and improve their understanding. In addition, hologram technology has a positive impact developing creative thinking, improving problem solving skills, and strengthening cooperation and communication (Kim, Jung, & Kim, 2018).

Augmented reality, virtual reality and digital hologram applications from innovative technologies, were thought to contribute to learn scientific concepts in a more enjoyable way, to increase students' scientific literacy level, to use mobile applications in education and to integrate the use of telephones into education. It is thought that innovative technology applications will be effective especially in the instruction of science subject or concepts, which are highly abstract, because they address more than one senses. In this context, this study is planned to be carried out with science teachers. This study is based on the project "Innovative Approaches in Science Education for Enriched Educational Material Production", which was supported by TUBITAK (The Scientific and Technological Research Council of Turkey) 4005 Innovative Education Practices Support Program. This program is for teachers and academicians. It aims at interactively developing innovative approaches, strategies, methods and techniques specific to its branches and teaching profession in general. Augmented reality applications are among the types of activities to be supported in this project type. For this type of projects, the duration of teacher trainings, the total number of event days is limited to a maximum of 10 days, including welcoming meeting and closing ceremonies. Therefore, the duration of the activities was limited to 6 days for this study due to the regulations for the project type.

### The Aim of the Study and Research Questions

This study aims to examine the experiences of science teachers in the training process they attended on innovative technology applications. For this purpose, the following questions were addressed:

1. What are the opinions of science teachers regarding the positive and negative aspects of using innovative technology (augmented reality, virtual reality, digital hologram) applications in science education?
2. What are the experiences and skills acquired by science teachers during the activities?
3. What are the thoughts, suggestions and future plans of science teachers about the activities they attended during the project?

## METHOD

### Research Design

This study was designed as a qualitative case study. Case studies aim to investigate a particular case in detail, rather than being an experimental research, where the answer of the "what can we learn from this case?" question is sought (Stake, 2008). Since case studies contain a lot of data, the data analysis process is a complex process requiring careful execution (Mills, Durepos, & Wiebe, 2010). The difference of this type of research from other research methods is that it focuses on how and why questions and allows in-depth investigation of an event or phenomenon that cannot be controlled by the researcher (Yildirim & Simsek, 2016).

This study was carried out as part of a project where science teachers experienced innovative technology applications for a week. According to Creswell (2007), case study is an in-depth examination of a limited system based on large and comprehensive data sets. In this study, a case study was used to examine teachers' experiences of innovative technology applications in a real environment in a one-week period.The case examined in the study consists of science teachers' experiences related to various augmented reality, virtual reality and digital hologram applications. Researchers need different types of data to develop deep understanding of the situation under study (Creswell, 2011). Therefore, the data sources of the study consist of daily activity evaluation forms, reflection forms and e-portfolios.

## Participants

35 science teachers who were working in the public schools affiliated to the Ministry of Education, located in seven different regions of Turkey, in 2018-2019 academic year have participated in the study. In qualitative research, it is seen that the selection of the study group deliberately uses diversity and include participants different characteristics for validity and reliability (Merriam, 2013). The purpose of choosing maximum diversity sampling methods were used in this study is to find common points of science teachers with different characteristics regarding their technology experiences. Diversity was targeted in terms of variables such as provinces, teaching experience, and gender in the selection of participants. Since this study aims to reveal the innovative technology experiences of science teachers, working as a science teacher in schools affiliated to the Ministry of National Education and not attending a training on innovative technology applications before were sought as the criteria for selection of the participants. The demographic information of the science teachers participating in the study is presented in Table 1.

**Table 1.** Demographic characteristics of science teachers

| Variables | | N | % |
|---|---|---|---|
| Gender | Female | 18 | 51.4 |
| | Male | 17 | 48.6 |
| Seniority | 1-5 years | 8 | 22.6 |
| | 5-10 years | 9 | 25.7 |
| | 10-15 years | 10 | 28.6 |
| | 15-20 years | 5 | 14.3 |
| | 20-34 years | 3 | 8.6 |
| Graduated Department | Science Teaching | 34 | 97.1 |
| | Physics | 1 | 2.9 |
| Region | Black Sea region | 5 | 14.3 |
| | Marmara region | 5 | 14.3 |
| | Aegean region | 5 | 14.3 |
| | Mediterranean region | 5 | 14.3 |
| | Central Anatolia region | 6 | 17.1 |
| | Eastern Anatolia region | 5 | 14.3 |
| | Southeastern Anatolia region | 4 | 11.4 |

As shown in Table 1, teachers from seven different regions of Turkey's have participated in the study. In addition, diversity was sought in the provinces where the teachers worked. The 35 participants of this study were from 34 different provinces.

## Research Process

In Tubitak-4005 project, which led to the emergence of this work, project director, three experts, three graduate students (guides) and fourteen instructors took part. One of instructors was the project manager, and three of them were also participated as the project`s experts. Instructors were working in nine different universities and in a science experiment center. Five of the instructors are specialists in science education, six in information technologies, one in physics and two in engineering. Two of the graduate students were from science education and one from information technologies.

A pilot study was carried out prior to the application in order to ensure a smooth research process. A one-day program was set, and a pilot application was carried out before the research activities, at the school where five science teachers were working in Eskisehir. The pre-application covered the pilot applications of the following topics: Let's Get to Know Augmented and Virtual Reality: What Can We Do?, Review of Science Education Curriculum in terms of Innovative Technology Applications, We Design Our Virtual Glasses, Digital Hologram Applications as Ice Breakers in Science Education. After the pilot study, the activities were evaluated with the teachers, and the content of the activities was improved, and an activity evaluation form was created. Activity evaluation form consisted of the questions including the opinions of the participants about the activities they attended that day, their contributions in terms of using innovative technologies and effects on their professional development.

In the actual application of this study, teachers were provided with one-week, 36 hours of training on innovative technology applications. Since the opening activity and meeting took place on the first day of the program, the trainings started on the second day. This training program included 18 activities. Regarding the methodology, augmented reality applications, workshops, collaborative group works, and mobile applications took place during the training sessions. Activities planned within the scope of the project were carried out in an interactive and practical way. The titles of some activities are: Let's Get to Know Augmented Reality and Virtual Reality: What Can We Do? Let's Design an Augmented Reality Application, Review of Science Education Curriculum in terms of Innovative Technology Applications, Investigation of Microscopic Creatures with MikrosAR, We Design our VR Glasses. The visual about Let's Design an Augmented Reality Application is presented below in Figure 1.

**Figure 1.** The visual about Let's Design an Augmented Reality Application

Research activities took place for 1.5-hour and 3-hour periods. On the first day of the training, activities introducing augmented reality and virtual reality, designing an augmented reality application, and reviewing science curriculum in terms of innovative technology applications took place; and pre-reflection forms were filled by the participants. On the second day of the training, the activities involving the examination of augmented reality in different disciplines and the applications of augmented reality in science education were carried out. The third day of the event included educational applications of virtual reality, virtual reality laboratories, applications of virtual reality in science education and making virtual glasses. On the fourth day of the training, holographic applications, hologram design, and digital hologram applications as ice breakers in science education were covered. The visual about Holographic Applications in Science Education is presented in Figure 2. On the fifth day of the event, the use of mixed reality in science education, and designing educational settings of the future with innovative technologies activities were carried out. In addition, a trip to the Eskisehir Science Experiment Center Sabanci Space House was organized and a talk on "A Journey in the Universe and Astronomy" was held.

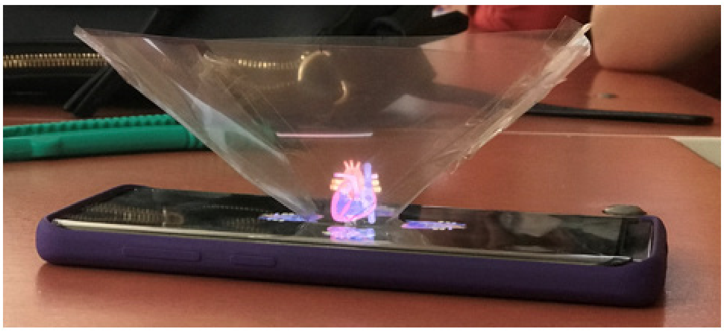

**Figure 2.** The visual about Holographic Applications in Science Education

## Data Collection Tools

Daily activity evaluation forms and reflection form developed by the researchers, and e-portfolios were used as data collection tools. In the development of these data collection tools, one assessment and evaluation, two science education and two information technology experts were consulted. Experts were asked to evaluate the comprehensibility of the questions in the data collection tools, the scope of the subject covered, etc. Final version of the daily activities evaluation form was formed during the pilot study. The activity evaluation form, which was originally planned to be used for each activity, was planned to be used at the end of daily activities according to the expert opinions. However, the pre and post reflection forms were initially prepared to include the same questions, the final reflection form was arranged to include innovative technology application experiences after expert opinions. The content of the e-portfolios also finalized As based on the expert opinions. The content of the product file includes 5 sections: designing an augmented reality application, designing virtual glasses, designing a hologram pyramid, mobile hologram pyramid applications, and creating a hologram video. For e-portfolios, digital products / photos / videos prepared for the event were requested to be uploaded.

The pre-reflection form applied in the first day of the training, before the activities have started, included questions about teachers' use of technology, their knowledge about innovative technologies, and questions about their experience of using these technologies in their classes. After completing the programmed activities, teachers filled daily activity evaluation form. Participants filled six activity evaluation forms in total. Daily activity evaluation form (see Appendix 1) included three questions asking the opinions of participants about the activities they attended that day, contributions of the technologies in using innovative technologies and effects of what they have learned on their professional development. The reflection form (see Appendix 2) applied at the end of the activities included eight questions regarding the opinions of the teachers about the training they attended, their plans to use these technologies in their classes, and the experiences they received from the process. In addition, teachers created a product file (e-portfolio) consisting of educational materials they developed during the activities. Regarding the content of the activities, some activities involved the development of digital content and some others the development of concrete materials. The applications were introduced by the instructor, or the topics about the use innovative technologies in the classroom were discussed. E-portfolios included digital materials and photographs taken during the activity for the ones that do not involve digital content generation. Some examples of portfolios are presented in Figure 3.

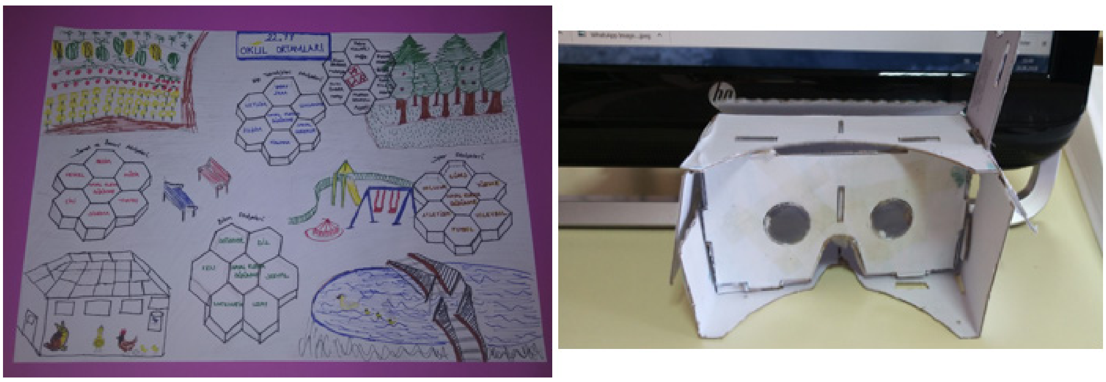

**Figure 3.** Pictures of Poster and Virtual Glasses from E-portfolios

## Data Analysis

In the research, content analysis was used to analyze the data obtained from the pre- and post-reflection form, the daily activity evaluation form and the e-portfolios. The analysis of qualitative data include categorizing, synthesizing, and interpreting the data from different data sources is to answer the research questions (Merriam, 2009). Analyzing the raw data, coding categories were tested, and data were coded to obtain a suitable set. Themes and trends in the data have been identified. In addition, the relationships in the data were sought. The patterns between the main themes in the data were examined. Then the data was presented in an explanatory framework. During the data analysis process, data was reduced, themes and patterns were analyzed, the relations were explored and explained. Explanations were supported by quotations from the participants' opinions. In order to keep the identity of the participants confidential while quoting from their opinions, codes were used (For example, P1-M represents/symbolizes that the first participant was male, while P3-F represents/symbolizes that the third participant was female).

Different methods were used by researchers to ensure the validity and reliability of qualitative case studies. One of them is to use a wide variety of data sources in order to ensure internal validity and to synthesize and support each other with the triangulation method (Mills et al., 2010). In this study, triangulation method was used by collecting data via multiple data collection tools at different stages of the application. In addition, understanding an existing case through the eyes of those involved instead of repeating the measurements or experiments is important to ensure the reliability of qualitative studies (Merriam, 1995). In this context, the case examined in this study was aimed to be presented from the eyes of the participants, through their experiences with their own expressions and the products they produced. Moreover, in order to ensure the reliability of the research, all three researchers analyzed the data separately, independent of each other. Afterwards, codes produced by each researcher were compared. A consensus was reached by discussing only a few codes that do not fit (Creswell, 2013). No statistical operation was performed during the comparisons. On the other hand, in order to evaluate the external validity (generalizability) of a qualitative study, it is important to provide the reader with all the details regarding the conditions under which the study was conducted, as well as the participants and the case (Merriam, 1995). In this sense, all details about the participants and the application process were given.

## FINDINGS

Findings from pre and post reflection forms, daily evaluation forms and e-portfolios are presented under three titles: the opinions about positive and negative aspects of using innovative technology applications in science education; experience and skills gained in trainings; and general thoughts, suggestions and future plans of the participants about the activities they attended during the project. Pre-training knowledge and experiences of the teachers participating in the study regarding innovative technology applications are given in Table 2.

**Table 2.** Pre-training knowledge and experiences of innovative technology applications

| Category | Code | Frequency (N=35) |
|---|---|---|
| Innovative technology applications knowledge | Somehow | 20 |
| | Yes | 12 |
| | No | 2 |
| | No comment | 1 |
| Knowledge of programs used in applications | No | 12 |
| | Yes | 11 |
| | Somehow | 11 |
| | No comment | 1 |
| Innovative technology applications experiences in class | Web 2.0 tools | 6 |
| | Augmented reality | 5 |
| | Mobile applications | 4 |
| | 3D applications | 4 |
| | Hologram making | 2 |
| | Virtual glasses | 1 |
| | Animation | 1 |
| | No experience | 12 |

Teachers mostly stated that they have partial knowledge about innovative technology applications, they either don't know or somehow know the programs used in innovative technology applications. As seen in Table 2, participants stated that they had experience with Web 2.0 tools, Augmented reality technologies, mobile and 3-D applications mostly. Four of the participants used hologram, virtual glasses, or animations in their classes. Even if only two participants reported they do not have any knowledge of innovative technologies; when they were asked about the specific application of those technologies, twelve participants reported that they 'No experience'. The statements of a teacher (P22-M) on this subject are as follows:

> "Yes, I use it often. Especially I prepare digital stories with Powtoon, which is one of the Web 2.0 tools, I sometimes teach by storytelling at the beginning of the topic. I use Kahoot application at the end of learning-teaching processes to measure and evaluate what students learned, and Mentimeter application in determining pre-subject (preliminary information, readiness levels) and post-subject level of the students in the form of pre-test, post-test".

## Opinions about The Positive and Negative Aspects of Using Innovative Technology Applications in Science Education

The results of the pre-reflection forms underlined increasing student interest and attracting student attention features of innovative technologies, whereas facilitating/concretizing learning are more emphasized in the statements expressed in the post-reflection form (Table 3). In addition, there is a slight increase in the number of people who think that innovative technologies are economical/practical in the post-reflection. Moreover, some opinions voiced by a small number of participants in pre-reflection, such as innovative technologies facilitate classroom control, contribute to collaborative learning, and increase creativity, are not mentioned in the post-reflection.

**Table 3.** Positive and negative aspects of using innovative technology applications in science education

| Positive Aspects | Pre-reflection form (%) | Post-reflection form (%) |
|---|---|---|
| Increasing participation/interest in the lesson- Attracting attention | 37 | 32 |
| Providing effective / permanent learning | 29 | 11 |
| Making learning easier - Concretizing | 23 | 36 |
| Fun learning | 11 | 7 |
| Experiencing hard-to-reach situations | 9 | 4 |
| Economic / practical / modern | 9 | 14 |
| Providing diversity | 3 | 4 |
| Recording learning data | 3 | - |
| Facilitates classroom control | 3 | - |
| Collaborative learning | 3 | - |
| Increasing creativity | 3 | - |
| **Negative Aspects** | **Pre-reflection form (%)** | **Post-reflection form (%)** |
| Distraction | 17 | 11 |
| Technology addiction | 11 | 14 |
| Timely / costly | 11 | 7 |
| Incorrect / unplanned use | 11 | 7 |
| Decrease interaction | 11 | 4 |
| Health | 6 | 7 |
| Pushing students to obtain effortlessly | 6 | 4 |
| Access | 3 | 21 |
| Failure in controlling the class | 3 | 14 |
| Insufficient teacher equipment | 3 | 7 |
| Replacing the teacher | 3 | - |
| Ethic | 3 | - |

Regarding positive and negative aspects of using innovative technology applications in science education that teachers mentioned in pre- and post-reflection forms, one of the prominent titles was making learning easier by concretizing abstract concepts. A teacher (P7-F) stated in the pre-reflection form that these technologies will help teacher to guide students to reach the learning outcomes stated in the curriculum; a teacher (P13-F) in post-reflection form emphasized that these technologies will enrich the lessons; whereas one teacher (P7-F) warned that these technologies should be used as auxiliary material. Even if the number of participants who mentioned this aspect slightly decreased in the post-reflections, the most reported advantage of using innovative technologies in science classes is attracting more student attention. It is interesting that while more participants were thinking these technologies supporting permanent learning in pre-reflections than post-reflections; more participants reported these technologies provide concrete examples in post-reflections than pre-reflections. It is also interesting that while a couple of participants perceived these technologies as facilitating classroom control in pre-reflections, a number of participants reported use of these technologies will make classroom control more difficult. The perception of these technologies cause distraction and/or decrease interaction tend to decrease after their experience using these technologies. On the other hand, more participants reported their concern about student access to these technologies.

The number of teachers who stated negative aspects of innovative technologies was less than those who stated positive aspects. The general trend was that these technologies can make a positive contribution to learning. However, regarding the answers given in the pre-and post-reflection forms, distracting student attention and leading to technology dependence can be named as the biggest concerns of the teachers regarding the negative aspects of innovative technologies. On the other hand, the answers given to the post-reflection form indicate that there are hesitations about students' access to these technologies. One participant (P16-M) expressed this concern as follows: "A negativity is that the technology infrastructure of the schools in some geographic regions are insufficient and it is not possible for all teachers to have a high level of interest in these issues". In addition, inability to control the class arises as another concern of teachers. A teacher who emphasized this issue (P10-F): "(Negative aspects of using innovative technology in the classroom) is time consuming, difficult to control students". Again, a teacher who described the use of innovative technologies in science education as negative in the pre-reflection form (P7-F) said "The negative feature is it can be problematic for the teacher in terms of the grasp and control of the class", whereas another teacher (P27-F) stated as "it may lead to problems such as increasing technology dependency or misuse".

## Experience and Skills Gained in Trainings

Teachers created a product file (e-portfolio) consisting of materials they developed during the activities and photos taken during the activities. Participants were observed to make designs and generate products by combining their science knowledge with creative technology applications. For example, during the activity titled "Transfer of Augmented Reality Applications to Science Teaching Settings: Spacecraft 3D", the participants examined the spacecrafts previously sent to space by NASA using Spacecraft 3D, a mobile augmented reality application. Then each group designed the spacecraft they choose using given materials. In this process, each group was observed to produce creative products in group presentations and shared photos at the end of the activity.

Participants were asked to share the digital products they developed, the photos of the non-digital products they developed, the documents they obtained about the activities, and other photos and videos taken during the activities in their e-portfolios. The review of e-portfolios showed that all participants except one uploaded at least one product to their portfolios. All materials in e-portfolios were grouped under 15 codes as shown in Table 4. Table 4 shows each major themes (categories) and codes and the number of participants who installed each product.

Table 4. Product, photo, document codes in e-portfolios

| Application category | Application name | Number of participants who installed |
|---|---|---|
| AG Applications | Mikrosar | 14 |
| | Augment | 15 |
| | Spacecraft | 25 |
| SG Applications | Virtual Lab. | 2 |
| | Glasses Trial | 9 |
| | Glasses Making | 22 |
| Hologram Applications | Pyramid template | 9 |
| | Pyramid usage | 18 |
| | Image hologram | 28 |
| | Audio-aided video | 23 |
| | Video hologram | 19 |
| Class of the future (poster on paper) | | 11 |
| Science experiment center (photos taken during the activity) | | 4 |
| Mixed reality (document) | | 2 |
| Group activities (photos taken during the activities) | | 26 |

Participants produced concrete or digital products for spacecraft, virtual glasses, pyramid usage, picture hologram and video hologram, which are given in Table 4. Since the materials developed in Spacecraft and virtual glasses making activities are not digital, the participants uploaded the photos of these products. For pyramid usage activity, they watched hologram videos in the hologram pyramids they created during the activity and shared the photos or videos of these applications in their product files. Regarding picture hologram and video hologram applications, they shared the products they created in video format in their files. For these five main topics, 26 of the participants were observed to upload at least three out of the five products, 3 participants uploaded two products, and 5 participants uploaded only one product.

Regarding the remaining ten titles, the participants worked on digital media and materials during the activity for Mikrosar, Augment, Virtual Lab, Virtual Glasses Trial and Mixed Reality, but due to the insufficiency of time required to develop a product the photos and source documents obtained in these applications were shared in product files. Pyramid template and its effectiveness was carried out as the preliminary stage of the pyramid usage activity, whereas the audio-visuality activity was the preliminary work of the video hologram activity. Science experiment center activity was held in Eskisehir Sabanci Space House, where participants observed virtual reality shows related to various themes including space, planets, stars and earth. Four participants included the photos of this event in their product files. Regarding the “class of the future” activity, the time allocated to the activity was insufficient, therefore participants completed this activity in the time remaining from other activities and shared the photos of the posters or group works they prepared in the product files. Participants were frequently involved in group activities during the training. In the photos shared in e-portfolios, participants were observed to continue group work apart from the activities and their social interactions were high. They were observed to develop and share projects about the use of technology in science, as well as plans and project ideas for the future outside of the activity hours, during the breaks and meals. 26 participants were seen to share at least one photographs in which such group activities were carried out.

In their daily evaluations about activities, all teachers who participated in the project made positive evaluations when they were asked about the contribution of the project to their personal and professional development. As personal experiences, they thought that the training developed them in terms of preparing materials using the technologies they learned or using the technology itself, as professional experiences they thought that they could use these technologies or materials they developed in their classes. Exemplar statements of participants are given below:

"Yes. I can now prepare my own hologram" (P4-M)

"Yes. I learned to make materials that I can use in the classroom" (P9-M).

"I had no experience, but in a week, we got a lot of information on these topics," (P24-M)

"I think I achieved a sufficient level with Camtasia about hologram production. I can also make a video hologram with CyberLink" (P13-F)

## Thoughts, Suggestions and Future Plans of the Participants

General thoughts, suggestions and future plans of the participants about the activities they attended during the project were determined by examining post-reflection forms and the findings from the diaries. The general thoughts, suggestions and future plans of the participants are presented in Table 5 under the following headings: thoughts, the parts that participants have difficulty, suggestions for increasing the use of the prepared materials in science classes and possible applications in their classes.

**Table 5.** General thoughts, suggestions and future plans about trainings

| Category | Code | Frequency |
|---|---|---|
| Thoughts | Positive thoughts | 17 |
| | Positive and negative thoughts | 6 |
| | Negative Thoughts (emphasized deficiencies/failures in education) | 4 |
| | No thoughts | 1 |
| The parts that participants have difficulty | Unity software | 12 |
| | Technical issues | 6 |
| | Training time | 4 |
| | Programming part | 3 |
| | Content generation software | 3 |
| Suggestions for increasing the use of the prepared materials in science classes | Training&cooperation | 11 |
| | Infrastructure development | 6 |
| | Increasing applications | 4 |
| | Sample lesson development | 3 |
| Possible applications in their classes | Astronomy and/or space concepts | 11 |
| | At the introductory stage of the lessons | 10 |
| | In the concretization of abstract concepts | 5 |
| | During the deepening of the subject | 4 |

Regarding the participants` thoughts about the activities they attended within the framework of the data obtained from the post-reflection forms, they were observed to express positive thoughts about the trainings they attended. One participant (P1-M) said, "It was a very productive and enlightening training", whereas another participant (P16-M) expressed his opinion as "It was an effective, efficient training, involving both theory and practice. It was a concretized program associated with our field". The findings obtained from the diaries support these views as well. A teacher stated her opinion on this issue as, "Yes, I have learned applications like preparing a hologram video that I have not experienced before" (P10-F). Another opinion that shares this opinion is, "Yes. It was effective to live the virtual reality and see the design of virtual glasses" (P26-F).

Regarding the opinions about whether participants experienced difficulties during the training activities, they stated that they mostly had difficulties in Unity software. This is followed by technical problems, duration of the training, programming part and content generation software. One participant said, "I had difficulties in the applications such as Unity. We could have worked on it a little more" (P14-F). Some of the participants stated that they faced technical problems during the activities and had difficulties in dealing with them. One participant mentioned the internet problem they experienced as "WiFi connection was required to download some applications. WiFi signal could not be caught from the classroom, therefore we had to leave the class and go to the WiFi point. Since the lesson continued while we were out, we missed it" (P15-F). Another participant told about the problem he experienced with the materials "We had difficulties in performing VR glasses design activity because the cardboard was quite thick, and the material given was deficient (the utility knife was broken)" (P22-M).

As the trainings were not held in the computer lab, the participants were observed to have difficulty in following the trainings that were performed through show & do technique. One opinion that supports this is "There were times that we missed the instruction of the teacher when we were downloading the programs" (P22-M). One of the participants who emphasized the difficulty of the programs used and stated that they require programmer skills, expressed her opinion as "Some of the activities required technical knowledge, which challenged me. I had trouble in applying programs that require software or programming knowledge" (P30-F). A participant who stated that they had difficulties due to full time training and that it was difficult to gain skills in innovative technologies with this kind of training said "Yes, I believe that some programs cannot be learned in a couple of hours" (P29-M). These comments represent two results: first, some teachers do not prefer application that require higher level technology and software skills. Offering trainings on easy-to-use technologies would be helpful to reach more teachers and might increase use of these technologies in the classroom. On the other hand, there is group of teachers who would love to learn about technologies that require higher level of technology skills. However, the structure and time-span for trainigns on this type of technologies should be different. More preparation should be needed to provide access to the participant teachers for particular software and they need more time for practice.

The suggestions for increasing the use of materials prepared for innovative technology applications in science classes were analyzed under the headings of educational cooperation, infrastructure development, increasing applications and sample lesson development. The opinion that the participants mentioned most in their suggestions is to increase education and training activities. One of the participants who expressed her views on collaboration with experts in the field said, "Especially information should be provided to my teacher colleagues about this" (P26-F), while another participant expressed it as "In order to increase the use of these technologies, cooperation should be done with the experts" (P33-F). Another opinion that supports them is: "It is necessary to increase the number of this type of trainings reaching more stakeholders" (P6-M). These comments indicate that teachers are willing to partipate in similar activities that brings together experts/university and teachers together. They prefer that the number of these type of training shoul be increased. On the other hand, awareness activities should be organized to gather more teacher attention on innovative technologies.

Another issue that the participants made suggestions is about the infrastructure efforts required to use these technologies. A participant stated that "technological equipment such as tablet, VR glasses should be provided to schools" (P15-F), another participant (P30-F) stated that necessary infrastructure should be established, and all teachers should be trained. One participant who expressed his opinion about increasing practices and developing sample lessons in this field expressed his opinion as "More applications should be prepared and offered to the use of our teachers through various communication tools" (P12-M). Another participant stated that "It would be great if there were AR applications not only in space topic, but also in the topics such as systems, cells, DNA, and the structure of the atom" (P5-F). One participant (P13-F) stated that the development, implementation and evaluation of interdisciplinary sample lesson plans will make their task easier. In this sense, it can be said that there is a need inscreasing the number of applications developed using innovative technologies, especially different topics in the field of science. At the same time infrastructure should be provided in schools.

Regarding the answers given to the question "whether the participants are planning to include innovative technology applications in their classes", and if they plan, "at what stage and instructing which concepts they intend to include them", the participants mostly stated that they plan to include these applications in astronomy and/or space concepts. This was followed by the introduction part of the lesson, the concretization of abstract concepts, and the deepening of the subject. The participants emphasized that they wanted to include innovative technology applications especially in teaching astronomy and space concepts and underlined that they particularly chose these topics because they are quite difficult to conceptualize for students. A participant explained his opinion as "… I will use it to describe invisible concepts or space issues that are very difficult to reach" (P3-M), another participant said, "I plan to use these technologies in the topics related to space, in performing the experiments and applications that are dangerous or impossible in real-life settings..."(P19-F). We can tell that as they stated teachers would prefer using innovative technologies parcilularly for the concepts that is hard, dangerous or impossible in real life and also use of these technologies would not be limited to any part of the class time.

## DISCUSSIONS AND CONCLUSION

In this research, after providing a 36-hours training to 35 science teachers on innovative technology applications, their experiences of generating educational materials in science education were examined. Regarding pre-training knowledge and experiences of the teachers participating in the study about innovative technology applications, the teachers were mostly observed to be partially informed about innovative technology applications, they either did not know or partially know the programs used in innovative technology applications. Web 2.0 tools was stated the most as the technology application tool used by teachers in their lessons. In the study conducted by Timur and Ozdemir (2018), in which teachers' opinions on using augmented reality settings in science education were examined, half of the teachers who participated in the study stated that they have used computer and smart board before, but they have not heard anything about AR applications. The findings of the research support the findings of this study.

When asked about the positive and negative aspects of using innovative technology applications in science education, teachers generally mentioned the positive aspects of innovative technologies. In the pre-reflection, increasing student interest and attracting student attention features of innovative technologies come to the forefront, whereas the statements in post-reflection emphasized facilitation/conceptualization of the learning. The findings of many studies reporting that AR, one of the innovative technologies, facilitates understanding of concepts (Abdusselam & Karal, 2012; Kaufmann & Schmalstieg, 2003; Klopfer & Squire, 2008) helps to concretize abstract concepts (Chang et al., 2015; Huang et al., 2016; Lin et al., 2013; Sommerauer & Muller, 2014; Tsai et al., 2013); and attracts students' attention and interest to the lesson (Di-Serio et al., 2013; Farias, Dantas, & Burlamaqui, 2011; Rizov & Rizova, 2015) support the findings of this research. On the other hand, a study concluded that using virtual reality technologies in the class increases students' interest and motivation towards the lesson (Ling & Rui, 2016; Yildirim et al., 2018; Yildirim, Sahin-Topalcengiz, Arikan, & Timur, 2020); as well as the meta-analysis study conducted by Barkhaya and Halim (2016), reported that 3-dimensional holograms are an effective teaching tool to attract students' attention and improve their understanding. The reason of this is the fact that 3-dimensional holograms can improve students' understanding by splitting a complex topic into a simpler form. However, according to the answers given by the teachers in the pre and post-reflection forms, distraction and causing technology dependence were mostly stated as the negative aspects of innovative technologies. The study of Dunleavy, Dede and Mitchell, (2009) reported that teachers and students find AR simulation interactive and interesting, while on the other hand, it brings unique technological, managerial and cognitive challenges to teaching and learning. This finding supports the findings of the research in terms of revealing the negative aspects of technology.

Product files (e-portfolio) consisting of enriched materials developed by teachers during the activities and photographs taken during the event were examined in order to reveal the experience and skills gained by the teachers who participated in the study. All participants except one were observed to upload at least one product to their portfolios. Participants produced concrete or digital products for spacecraft, virtual glasses, pyramid usage, picture hologram and video hologram. For these five main topics, 26 of the participants were observed to upload at least three out of the five products, 3 participants uploaded two products, and 5 participants uploaded only one product. When asked about the contribution of these activities to their personal and professional development, all teachers evaluated positively. In terms of personal experiences, they thought that preparing/using the technologies they learned developed them, whereas in terms of professional experiences they thought that they could use these technologies as materials in their classes. Participants stated that they gained the most skill in preparing holograms. The findings of the study that Ghuloum (2010) evaluated the effectiveness of 3-dimensional holograms as an educational tool, approximately half of the participants emphasized that 3-dimensional holograms are effective teaching tools; Yamaguchi and Yoshikawa (2012) revealed that holograms are effective in students' concrete learning. In their study aimed at supporting the thinking and problem-solving skills of pre-service teachers through holograms, Okulu and Unver (2016) observed that pre-service teachers' knowledge about astronomy increased with the products created by them in the field of astronomy. In this context, these findings highlight the importance of teachers' ability to prepare holograms, as well as the use these technologies in their classes for maximizing students' learning and supporting their own professional development. At the same time, making virtual glasses, using VR applications and using a ready-made AR application were mentioned as the skills gained by the participants. VR applications have a high potential in terms of increasing the motivation of learning and contributing to the comprehension of the content by giving the users a sense of being in a setting that is not there in reality, allowing interaction and increasing user participation (Ott & Tavella, 2009; Freina & Ott, 2015). In the experimental studies reviewed by Ozdemir (2017), helping to increase attention, helping to understand the subject and increasing the willingness to learn were at the top of the reported benefits of using AR. These studies highlight the importance of teachers' ability to use VR and AR applications.

Participants were observed to mostly have positive thoughts about the training they have participated in. They mostly stated that they had difficulty in Unity software. Participants emphasized that they plan to use innovative technology applications in especially in teaching difficult subjects such as astronomy and space concepts. Virtual reality programs were reported to be useful in the studies on teaching astronomy concepts (Barron & Orwig, 1997; Chen, Yang, Shen, & Jeng, 2007; Diakidoy & Kendeou, 2001; Trundle & Bell, 2010). In the study examining the educational augmented reality applications carried out by Arslan and Elibol (2015), it was found that there are educational applications in the subjects of Fossils, Dinosaurs and Animal Training, Science and Technology Education, Solar System and Space Education. In the study of Arici (2013) using virtual reality programs in the "Solar system and beyond: Space puzzle" unit, he concluded that 3-dimensional visual materials presented by virtual reality programs affected the achievement of 7th grade students in science and technology course. These findings support the findings of the research. In another study by Abdusselam (2014), teachers stated that augmented reality settings may provide benefits in visualizing and concretizing the magnetic field for teaching physics, especially magnetism. On the other hand, students stated that augmented reality setting helps them to understand and comprehend the events better, this setting offers a more realistic environment in applications, shapes the visuality, concretizes the concepts. Regarding their suggestions to increase the use of materials prepared for innovative technology applications in science lessons, participants mostly suggested to increase the trainings and applied professional development activities given by experts.

In summary, the review of the results shows that the teachers find innovative technologies positive in terms of increasing student interest, attracting student attention, and facilitating learning/concretization; whereas potential negativities such as distracting students` attentions and causing technology dependency. Science teachers stated that the project helped their personal development in the sense of preparing/using the technologies they learned and that they may use these technologies as course materials in their classes. In addition, the participants stated that they gained the most skill in preparing holograms. Additionally, they suggested the number of trainings given by experts and applied professional development activities should be increased.

## Limitation and Recommendations

In this study, 35 science teachers were given 36-hour training on innovative technology applications and their experiences of producing enriched materials in science education were examined. The number of participants and duration of the activities were determined according to the possibilities of type of the project. This situation constitutes the limitation of the study.

In order to increase the number of teachers who can develop enriched materials through augmented reality, virtual reality, hologram technologies, applied teacher trainings focusing on the widespread and effective use of current mobile applications for innovative technology applications in education can be expanded.

The participants of the study suggested that these trainings should focus on a single technology and include certain predetermined programs in more detailed way. On the other hand, new studies can be designed with different methods, data collection tools and various study groups in order to investigate the use of innovative technologies in the classes, the difficulties experienced in the real classroom setting and potential solutions after the completion of the trainings. Studies can be conducted in which innovative technologies are used in different units in the science course and its results are examined in terms of various variables (success, motivation, attitude, 21st century skills, interest in STEM areas, etc.).

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## REFERENCES

Abdusselam, M. S. (2014). Teachers' and students' views on using augmented reality environments in physics education: 11th grade magnetism topic example. *Pegem Journal of Education and Instruction*, 4(1), 59-74. Retrieved February 19, 2021 from http://pegem.net/dosyalar/dokuman/38291makale%204.pdf

Abdusselam, M. S., & Karal, H. (2012). Fizik ogretiminde artirilmis gerceklik ortamlarinin ogrenci akademik basarisi uzerine etkisi: 11. Sinif manyetizma konusu ornegi [The effect of mixed reality environments on the students' academic achievement in physics education: 11th grade magnetism topic example]. *Journal of Research in Education and Teaching*, 1(4), 170-181. Retrieved February 19, 2021 from http://jret.org/FileUpload/ks281142/File/20a.abdusselam.pdf

Abdusselam, M. S., Kilis, S., Sahin Cakir, C., & Abdusselam, Z. (2018). Examining Microscopic Organisms under Augmented Reality Microscope: A 5E Learning Model Lesson. *Science Activities*, 55(1-2), 68-74. doi: 10.1080/00368121.2018.1517717

Ahmad, S. A., Abdullahi, I. M., & Usman, M. (2015). General Attitude and Acceptance of Holography in Teaching among Lecturers in Nigerian Colleges of Education. *IAFOR Journal of Education*. https://eric.ed.gov/?id=EJ1100658

Aina, O. (2010). Application of holographic technology in education. Kemi-Tornio University of Applied Sciences. Retrieved February 19, 2021 from https://www.theseus.fi/handle/10024/23101

Aktamis, H., & Arici, V. A. (2013). Sanal gerceklik programlarinin astronomi konularinin ogretiminde kullanilmasinin akademik basari ve kaliciliga etkisi [The effects of using virtual reality software in teaching astronomy subjects on academic achievement and retention]. *Mersin University Journal of the Faculty of Education*, 9(2), 58-70. Retrieved February 19, 2021 from https://dergipark.org.tr/en/pub/mersinefd/issue/17383/181566?publisher=mersin-university

Arici V. A. (2013). Fen egitiminde sanal gerceklik programlari uzerine bir calisma: "Gunes sistemi ve otesi: Uzay bilmecesi" unitesi ornegi. Yayimlanmamis yuksek lisans tezi. Adnan Menderes Universitesi, Aydin. Retrieved February 19, 2021 from http://adudspace.adu.edu.tr:8080/jspui/handle/11607/1297

Arslan, A. & Elibol, M. (2015). Egitsel artirilmis gerceklik uygulamalarinin incelenmesi: Android isletim sistemi ornegi. *International Journal of Human Sciences*, 12(2), 1792-1817. doi:10.14687/ijhs.v12i2.3524

Barkhaya, N. M. M., & Halim, N. D. A. (2016, December). A review of application of 3D hologram in education: A meta-analysis. *2016 IEEE 8th International Conference on Engineering Education (ICEED)* (pp. 257-260). Kuala Lumpur: IEEE. doi: 10.1109/ICEED.2016.7856083

Billinghurst, M., Kato, H., & Poupyrev, I. (2001). The magicbook-moving seamlessly between reality and virtuality. *IEEE Computer Graphics and Applications*, 21. doi: 6–8, 10.1109/38.920621

Caliskan, E. (2017). Examination of Turkish master theses and doctoral dissertations in terms of using innovative technologies in education among 2011-2015. *Journal of Human Sciences*, *14*(1), 496-505. doi:10.14687/jhs.v14i1.4169

Chang, G., Morreale, P. & Medicherla, P. (2010). Applications of Augmented Reality Systems in Education. In D. Gibson & B. Dodge (Eds.), *Proceedings of SITE 2010--Society for Information Technology & Teacher Education International Conference* (pp. 1380-1385). San Diego, CA, USA: Association for the Advancement of Computing in Education (AACE). Retrieved February 19, 2021 from https://www.learntechlib.org/primary/p/33549/

Chang, K. E., Chang, C. T., Hou, H. T., Sung, Y. T., Chao, H. L., & Lee, C. M. (2014). Development and behavioral pattern analysis of a mobile guide system with augmented reality for painting appreciation instruction in an art museum. *Computers & Education*, 71, 185-197. https://www.sciencedirect.com/science/article/pii/S0360131513002868

Chang, Y. L., Hou, H. T., Pan, C. Y., Sung, Y. T., & Chang, K. E. (2015). Apply an augmented reality in a mobile guidance to increase sense of place for heritage places. *Educational Technology & Society*, 18(2), 166-178. Retrieved February 19, 2021 from https://www.jstor.org/stable/pdf/jeductechsoci.18.2.166.pdf

Chen, C. H., Yang, J. C., Shen, S., & Jeng, M. C. (2007). A desktop virtual reality earth motion system in astronomy education. *Educational Technology & Society*, 10(3), 289-304. Retrieved February 19, 2021 from https://www.jstor.org/stable/10.2307/jeductechsoci.10.3.289

Chen, C. M., & Tsai, Y. N. (2012). Interactive augmented reality system for enhancing library instruction in elementary schools. *Computers & Education*, 59(2), 638-652. doi:10.1016/j.compedu.2012.03.001

Chen, Y. C. (2006) A study of comparing the use of augmented reality and physical models in chemistry education. In: *International conference on virtual reality continuum and its applications*, Hong Kong, China, pp 369–372. https://doi.org/10.1145/1128923.1128990

Craig, A. B. (2013). *Understanding augmented reality: Concepts and applications.* Waltham, MA: Elsevier.

Creswell, J. W. (2007). *Qualitative inquiry & research design: Choosing among five approaches*. (2nd edition). Sage Publications.

Creswell, J. W. (2011). *Controversies in mixed methods*. In N. K. Denzin & Y. S. Lincoln (Eds.), The SAGE handbook of qualitative research (4th ed., pp. 269–284). Sage.

Creswell, J. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd edition). USA: Sage.

Dagdalan, G. (2019). Sanal gerceklik uygulamasi destekli fen bilimleri ogretiminin ogrencilerin bilissel duzeylerine, ust bilissel farkindaliklarina ve sanal gerceklik uygulamalarina iliskin tutumlarina etkisi (The effects of viirtual reality supported science education on students' cognitive levels, meta cognitive awareness and attitudes toward virtual reality) [Unpublished master's thesis]. Ordu University.

Di-Serio, A., Ibanez, M. B., & Kloos, C. D. (2013). Impact of an augmented reality system on students' motivation for a visual art course. *Computers & Education*, 68, 586-596. https://doi.org/10.1016/j.compedu.2012.03.002

Diakidoy, I. A. N., & Kendeou, P. (2001). Facilitating conceptual change in astronomy: A comparison of the effectiveness of two instructional approaches. *Learning and Instruction*, *11*(1), 1-20. https://doi.org/10.1016/S0959-4752(00)00011-6

Dunleavy, M., Dede, C., & Mitchell, R. (2009). Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning. *Journal of science Education and Technology*, 18(1), 7-22. https://doi.org/10.1007/s10956-008-9119-1

Durak, A. ve Yilmaz, F. G. K. (2019). Artirilmis gercekligin egitsel uygulamalari uzerine ortaokul ogrencilerinin gorusleri. *Abant Izzet Baysal Universitesi Egitim Fakultesi Dergisi*, 19(2), 468-481. https://doi.org/10.17240/aibuefd.2019.19.46660-425148

Eve, E. J., Koo, S., Alshihri, A. A., Cormier, J., Kozhenikov, M., Donoff, R. B., & Karimbux, N. Y. (2014). Performance of Dental Students Versus Prosthodontics Residents on a 3D Immersive Haptic Simulator. *Journal of Dental Education*, 78(4), 630-637. https://doi.org/10.1002/j.0022-0337.2014.78.4.tb05715.x

Farias, L., Dantas, R., & Burlamaqui, A. (2011, September). Educ-AR: A tool for assist the creation of augmented reality content for education. *In 2011 IEEE International Conference on Virtual Environments, Human-Computer Interfaces and Measurement Systems Proceedings* (pp. 1-5). IEEE. doi:10.1109/VECIMS.2011.6053850

Freina, L., & Ott, M. (2015, April). A literature review on immersive virtual reality in education: state of the art and perspectives. *In the International Scientific Conference eLearning and Software for Education* (Vol. 1, p. 133). « Carol I» National Defence University. https://search.proquest.com/publication/1876338?accountid=16716

Ghuloum, H. (2010). 3D Hologram Technology in Learning Environment. *Proceedings of Informing Science & IT Education Conference* (InSITE) 2010, (pp. 693-704). Retrieved February 19, 2021 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.381.5418&rep=rep1&type=pdf

Gonzato, J. C., Arcila, T., & Crespin, B. (2008). Virtual Objects on Real Oceans. *18th international conference on Computer Graphics*. Moscow, Russia: GraphiCon. Retrieved February 19, 2021 from https://hal.archives-ouvertes.fr/hal-00341028

Green, J., Wyllie, A., & Jackson, D. (2013). Virtual worlds: A new frontier for nurse education? Collegian. https://doi.org/10.1016/j.colegn.2013.11.004

Hsiao, K. F., & Rashvand, H. F. (2011). Body language and augmented reality learning environment. *MUE*, 246-250, Taiwan. doi: 10.1109/MUE.2011.51

Hsiao, K. F., Chen, N. S., & Huang, S. Y. (2011). Learning while exercising for science education in augmented reality among adolescents. *Interactive Learning Environments*, 20, 331–349. https://doi.org/10.1080/10494820.2010.486682

Huang, T. C., Chen, C. C., & Chou, Y. W. (2016). Animating eco-education: To see, feel, and discover in an augmented reality-based experiential learning environment. *Computers & Education*, 96, 72-82. https://doi.org/10.1016/j.compedu.2016.02.008

Ibanez, M. B., Di-Serio, A., Villaran-Molina, D., & Delgado-Kloos, C. (2014). Experimenting with electromagnetism using augmented reality: Impact on flow student experience and educational effectiveness. *Computers & Education*, 71, 1–13. https://doi.org/10.1016/j.compedu.2013.09.004

Kageyama, A. (2013). Keynote talk 1: Simulations and visualizations of magnetic fields in nature. In System Integration (SII), *2013 IEEE/SICE International Symposium* on (pp. 1-1). IEEE. doi: 10.1109/SII.2013.6776767

Kaufmann, H., & Schmalstieg, D. (2003). Mathematics and geometry education with collaborative augmented reality. *Computers & Graphics*, 27(3), 339-345. https://doi.org/10.1145/1242073.1242086

Ke, F., & Hsu, Y. C. (2015). Mobile augmented-reality artifact creation as a component of mobile computer-supported collaborative learning. *The Internet and Higher Education*, 26, 3341. https://doi.org/10.1016/j.iheduc.2015.04.003

Kerawalla, L., Luckin, R., Seljeflot, S., & Woolard, A. (2006). Making it real: Exploring the potential of augmented reality for teaching primary school science. *Virtual Reality*, 10, 163–174. doi: 10.1007/s10055-006-0036-4

Kim, B. H., Jung, M. Y., & Kim, J. (2018). Development and application of 3D-hologram maker education materials for high school students in Korea. *Advanced Science Letters*, *24*(3), 2114-2117, doi: https://doi.org/10.1166/asl.2018.11867

Kipper, G., & Rampolla, J. (2012). Augmented reality: An emerging technologies guide to AR, Elsevier Science, Waltham, MA. Retrieved February 19, 2021 from http://hdl.handle.net/10045/60925

Klopfer, E., & Squire, K. (2008). Environmental detectives: The development of an augmented reality platform for environmental simulations. *Education Technology Research and Development*, 56(2), 203-228, doi: https://doi.org/10.1007/s11423-007-9037-6

Koyunlu Unlu, Z. & Dokme, I. (2020). The effect of technology-supported inquiry-based learning in science education: Action research. *Journal of Education in Science, Environment and Health (JESEH)*, *6*(2), 120-133. doi:10.21891/jeseh.632375

Lin, T. J., Duh, H. B. L., Li, N., Wang, H. Y., & Tsai, C. C. (2013). An investigation of learners' collaborative knowledge construction performances and behavior patterns in an augmented reality simulation system. *Computers & Education*, 68, 314-321. https://doi.org/10.1016/j.compedu.2013.05.011

Ling, H., & Rui, L. (2016, August). VR glasses and leap motion trends in education, *2016 11th International Conference on Computer Science & Education (ICCSE)*, Nagoya, Japan, pp. 917-920. doi: 10.1109/ICCSE.2016.7581705

Merriam, S. (1995). What can you tell from an N of 1?: Issues of validity and reliability in qualitative research. *PAACE Journal of Lifelong Learning*, 4, 51–60. https://eric.ed.gov/?id=EJ497233

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation* (3rd ed). San Francisco, CA: Jossey-Bass.

Merriam, S. B. (2013). *Nitel arastirma desen ve uygulama icin bir rehber.* (Cev. Ed.: S. Turan). Ankara: Nobel Yayincilik.

Mills, A. J., Durepos, G., & Wiebe, E. (2010). *Sage Encyclopedia of Case Study Research* (two volumes). Sage, Thousand Oaks, CA.

Morehead, M., Jones, Q., Blatt, J., Holcomb, P., Schultz, J., DeFanti, T., ... & Spirou, G. A. (2014). Poster: BrainTrek-An immersive environment for investigating neuronal tissue. *In 3D User Interfaces (3DUI), 2014 IEEE Symposium* on (pp. 157-158). IEEE. doi: 10.1109/3DUI.2014.6798868

Okulu, H. Z., & Unver, A. O. (2016). Bring cosmos into the classroom: 3D hologram. Shelley, M., Kiray, A., & Celik, I. (Ed), Education Research Highlights in Mathematics, *Science and Technology* (s. 81-86). ISRES Publishing. Retrieved February 19, 2021 from https://www.uebad.org/books/ERHMST_08-05-2019.pdf#page=86

Orhan, S., & Karaman, M. K. (2011). Egitimde gerceklige yeni bir bakis: Harmanlanmis ve genisletilmis gerceklik. *XVI. Turkiye'de Internet Konferansi*. Retrieved February 19, 2021 from http://inet-tr.org.tr/inetconf16/bildiri/76.pdf

Ott, M., & Tavella, M. (2009). A contribution to the understanding of what makes young students genuinely engaged in computer-based learning tasks. *Procedia-Social and Behavioral Sciences*, 1(1), 184-188, doi:10.1016/j.sbspro.2009.01.034

Ozarslan, Y. (2013). Genisletilmis gerceklik ile zenginlestirilmis ogrenme materyallerinin ogrenen basarisi ve memnuniyeti uzerindeki etkisi (The effect of augmented reality enhanced learning materials on learners' achievement and learners' satiifaction) [Unpublished doctoral dissertation]. Anadolu University.

Ozdemir, M. (2017). Artirilmis gerceklik teknolojisi ile ogrenmeye yonelik deneysel calismalar: Sistematik bir inceleme [Experimental studies on learning with augmented reality technology: A systematic review]. *Mersin University Journal of the Faculty of Education*, 13(2), 609-632. doi: 10.17860/mersinefd.336746

Robin, A. (2013). "Hologram as teaching agents," *Journal of Physics Conf. Series* 415. Retrieved February 19, 2021 from https://iopscience.iop.org/article/10.1088/1742-6596/415/1/012076/meta.

Seo, J., Kim, N., & Kim, G. J. (2006). Designing Interactions for Augmented Reality Based Educational Contents. In: Pan Z., Aylett R., Diener H., Jin X., Gobel S., Li L. (eds) Technologies for E-Learning and Digital Entertainment. Edutainment. Lecture Notes in Computer Science, vol 3942. Springer, Berlin, Heidelberg. https://doi.org/10.1007/11736639_149.

Stake, R. E. (2008). *Qualitative case study*. In N. K. Denzin & Y. S. Lincold (Eds.), Strategies of qualitative inquiry. Sage.

Sin, A. K, & Zaman, H. B. (2010). "Live Solar System (LSS): Evaluation of an augmented reality book-based educational tool," *2010 International Symposium on Information Technology*, Kuala Lumpur, Malaysia, pp. 1-6. doi: 10.1109/ITSIM.2010.5561320

Sommerauer, P., & Muller, O. (2014). Augmented reality in informal learning environments: A field experiment in a mathematics exhibition. *Computers & Education*, 79, 59-68, https://doi.org/10.1016/j.compedu.2014.07.013

Sudeep, U. (2013). Use of 3D hologram technology in engineering education. *Journal of Mechanical and Civil Engineering*, *4*, 62-67. Retrieved November 13, 2020 from https://www.researchgate.net/publication/329208987

Tepe, T., Kaleci, D., & Tuzun, H. (2016). Egitim Teknolojilerinde Yeni Egilimler: Sanal Gerceklik Uygulamalari. In 10th International *Computer and Instructional Technologies Symposium (ICITS)* (pp. 547-555). Retrieved February 19, 2021 from http://yunus.hacettepe.edu.tr/~htuzun/html/academic/2016-ICITS%20-TepeKaleciTuzun.pdf

Timur, B., & Ozdemir, M. (2018). Fen egitiminde artirilmis gerceklik ortamlarinin kullanimina iliskin ogretmen gorusleri [Teachers' views on the use of augmented reality environments in science education]. *International Journal of Turkish Education Sciences*, 6(10), 62-75. https://dergipark.org.tr/en/pub/goputeb/issue/36631/354239.

Trundle, K. C., & Bell, R. L. (2010). The use of a computer simulation to promote conceptual change: A quasi-experimental study. *Computers & Education*, 54(4), 1078-1088. https://doi.org/10.1016/j.compedu.2009.10.012

Tsai, M. K., Liu, P. H. E., & Yau, N. J. (2013). Using electronic maps and augmented realitybased training materials as escape guidelines for nuclear accidents: An explorative case study in Taiwan. *British Journal of Educational Technology*, 44(1), E18-E21. doi:10.1111/j.1467-8535.2012.01325.x

Virtual reality. (2021, Fenruary 20). In *Wikipedia*. https://en.wikipedia.org/wiki/Virtual_reality

Wojciechowski, R., & Cellary, W. (2013). Evaluation of learners' attitude toward learning in ARIES augmented reality environments. *Computers & Education*, 68, 570-585. https://doi.org/10.1016/j.compedu.2013.02.014

Wu, H. K., Lee, S. W. Y., Chang, H. Y., & Liang, J. C. (2013). Current status, opportunities and challenges of augmented reality in education. *Computers & education*, 62, 41-49. https://doi.org/10.1016/j.compedu.2012.10.024

Yamaguchi, T., & Yoshikawa, H. (2012). New education system for construction of optical holography setup tangible learning with augmented reality. *Journal of Physics*, 415(1), 1-8. Retrieved February 19, 2021 from https://iopscience.iop.org/article/10.1088/1742-6596/415/1/012064/pdf

Yildirim, A. ve Simsek, H. (2016). Sosyal bilimlerde nitel arastirma yontemleri. Ankara: Seckin Yayincilik.

Yildirim, B., Sahin-Topalcengiz, E., Arikan, G., & Timur, S. (2020). *Using virtual reality in the classroom: Reflections of STEM teachers on the use of teaching and learning tools. Journal of Education in Science, Environment and Health (JESEH)*, *6*(3), 231-245. doi:10.21891/jeseh.711779

Yildirim, F. S. (2020). The effect of the augmented reality applications in science class on students' cognitive and affective learning. *Journal of Education in Science, Environment and Health (JESEH)*, *6*(4), 259-267. doi:10.21891/jeseh.751023

Yildirim, G., Elban, M., & Yildirim, S. (2018). Analysis of use of virtual reality technologies in history education: A Case Study. *Asian Journal of Education and Training*, 4(2), 62-69. doi: 10.20448/journal.522.2018.42.62.69

Zagoransk, S., & Divjak, S. (2003). Use of Augmented Reality in Education. *The IEEE Region 8 EUROCON 2003* (s. 339-342). Ljubljana, Slovenia: IEEE. doi: 10.1109/EURCON.2003.1248213.

## APPENDIX 1

### Gunluk Yapilan Etkinlikleri Degerlendirme Formu

Tarih Seciniz:

Adiniz Soyadiniz:

Cinsiyet:

Yas:

Kidem:

1. Bugunku egitim/etkinlikler sirasinda hangi teknolojiler hakkinda bilgi sahibi oldunuz? Aciklayiniz.
2. Bugun katildiginiz egitim/etkinlikler etkili bir sekilde duzenlenmis miydi? Aciklayiniz.

3.Sizce bu proje kisisel ve mesleki gelisiminiz icin degerli bir deneyim oldu mu? Aciklayiniz.

4. Belirtmek istediginiz diger gorusleriniz:

## APPENDIX 2

## Fen Egitiminde Zenginlestirilmis Materyal Uretiminde Yenilikci Yaklasimlar Egitim Oncesi Yansitma Formu

**Yonerge:** Fen egitiminde zenginlestirilmis materyal uretimine yonelik egitimler duzenliyoruz. Bir fen bilimleri ogretmeni olarak, derslerinizde teknoloji kullanma durumunuz ve yenilikci teknoloji uygulamalari (artirilmis gerceklik, sanal gerceklik ve dijital hologram) hakkindaki bilgi ve deneyimlerinizi belirlemeyi amacliyoruz. Asagidaki ifadeler icin bilgi ve deneyimlerinizi bizimle paylasmanizi bekliyoruz. Lutfen, sizden elde edilen gorus ya da bilgilerin sadece bu arastirmada kullanilacagindan ve baska kimseyle paylasilmayacagindan emin olunuz. Kiymetli vaktinizi ayirarak goruslerinizi bizimle paylasmayi kabul ettiginiz icin tesekkur ederiz.

Tarih Giriniz

Adiniz Soyadiniz:

Cinsiyet:

Yas:

Kidem:

Mezun oldugunuz bolum:

**Genel Deneyimler**

Derslerinizde ogrencilerin dikkatini nasil topluyorsunuz?

Buz kirici etkinlikler nedir? Derslerinizde bunlardan yararlaniyor musunuz?

Derslerinizde ogretiminde zorlandiginiz konular var mi? Varsa ustesinden gelmek icin ne gibi yontemler kullaniyorsunuz?

**Teknoloji Deneyimleri**

Derslerinizde teknolojik materyallerden yararlaniyor musunuz?

Bir egitimci olarak egitim ve teknoloji arasindaki entegrasyonu nasil yorumlarsiniz?

Fen bilimleri dersinde kullanilabilecek ancak malzeme ve materyaller eksikliginden dolayi kullanamadiginiz hangi egitim teknolojilerinden haberdarsiniz?

Derslerinizde teknoloji kullanimina ihtiyac duyuyor musunuz? Duyuyorsaniz, genellikle dersin hangi asamasinda ve hangi konular icin?

Derslerinizde hangi teknolojik arac ve gereclerden nasil faydalaniyorsunuz?

**Yenilikci Teknoloji Uygulamalari Deneyimleri**

Yenilikci teknoloji uygulamalari (artirilmis gerceklik, sanal gerceklik ve dijital hologram) hakkinda bilginiz var mi?

Yenilikci teknoloji uygulamalarinda kullanilan programlar hakkinda bilgileriniz nelerdir?

Daha once derslerinizde yenilikci teknoloji uygulamalarina yer verdiniz mi? Yer verdiyseniz deneyimleriniz nelerdir?

Fen Egitiminde yenilikci teknoloji uygulamalarinin kullanilmasina iliskin dusunceleriniz nelerdir?

Yenilikci teknoloji uygulamalarinin fen egitiminde kullaniminin olumlu ve olumsuz yonleri hakkinda ne dusunuyorsunuz?

**Fen Egitiminde Zenginlestirilmis Materyal Uretiminde Yenilikci Yaklasimlar Egitim Sonrasi Yansitma Formu**

**Yonerge:** Fen egitiminde zenginlestirilmis materyal uretimine yonelik katildiginiz egitimler hakkindaki bilgi ve deneyimlerinizi belirlemeyi amacliyoruz. Asagidaki ifadeler icin bilgi ve deneyimlerinizi bizimle paylasmanizi bekliyoruz. Lutfen, sizden elde edilen gorus ya da bilgilerin sadece bu arastirmada kullanilacagindan ve baska kimseyle paylasilmayacagindan emin olunuz. Kiymetli vaktinizi ayirarak goruslerinizi bizimle paylasmayi kabul ettiginiz icin size tesekkur ederiz.

**Yenilikci Teknoloji Uygulamalari Deneyimleri**

Katildiginiz yenilikci teknoloji uygulamalarina (artirilmis gerceklik, sanal gerceklik ve dijital hologram) yonelik egitimler hakkinda dusunceleriniz nelerdir?

Yenilikci teknoloji uygulamalarini derslerinizde yer vermeyi planliyor musunuz? Planliyorsaniz dersin hangi asamasinda ve hangi konu ve kavramlarin anlatiminda yer verilebilir?

Yenilikci teknoloji uygulamalarina yonelik materyal hazirlama konusunda deneyiminiz nelerdir?

Yenilikci teknoloji uygulamalarina yonelik olarak katildiginiz etkinliklerde zorlandiginiz kisimlar oldu mu? Aciklayiniz.

Yenilikci teknoloji uygulamalarinin fen egitiminde kullaniminin olumlu ve olumsuz yonleri hakkinda ne dusunuyorsunuz?

Yenilikci teknoloji uygulamalarina yonelik hazirlanan materyallerin fen egitiminde kullaniminin olumlu ve olumsuz yonleri hakkinda ne dusunuyorsunuz?

Yenilikci teknoloji uygulamalarina yonelik hazirlanan materyallerin hangi sinif duzeyi ve hangi konular icin kullanilabilecegini dusunuyorsunuz?

Yenilikci teknoloji uygulamalarina yonelik hazirlanan materyallerin fen derslerinde kullaniminin artirilmasina yonelik onerileriniz nelerdir?

Son olarak eklemek istediginiz bir sey var mi?

# CRITICAL FACTORS INFLUENCING MOOCS RETENTION: THE MEDIATING ROLE OF INFORMATION TECHNOLOGY

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## ABSTRACT

In the current digital era, Massive Open Online Courses (MOOCs) are considered as an educational revolution specifically in the current situation of COVID-19. Although students from all over the globe register for MOOCs, only a small proportion of participants complete the online courses. MOOCs at present encounter the problem of low retention rates, thus providing numerous research gaps. This paper investigates the impact of critical factors such as the instructor's role, course relevancy, learning outcomes on MOOCs retention. This study also analyzes the mediating role of IT (Social Media) between critical factors and MOOCs retention and provides feasible solutions for the improvement of MOOCs retention rates. Data were collected from Pakistani participants who attended, registered, or completed any MOOC. The findings of this study indicate that critical factors such as the instructor's role, course relevancy, learning outcomes have a positive impact on MOOC participants' retention. The results also confirm the important mediating role of IT (Social Media). The universities and the instructors who offer MOOCs should consider these critical factors when offering an online course. These critical factors can enhance MOOCs participants' retention leading them to take the courses until certification.

**Keywords:** Course Relevancy, COVID-19, Instructor's role, IT (Social Media), Learning Outcome, MOOCs Retention.

## INTRODUCTION

Due to rapid advancements and innovations in technologies, the need and importance of Massive Open Online Courses (MOOCs) have increased in general and in particular during the crises such as the current COVID-19 pandemic situation. With the advent of COVID-19, the world has realized the importance of rather an effective way of learning and that is why the application of MOOCs has multiplied in the current scenario (Yuan & Powell, 2013). The online learning environment facilitates learning in higher education (Schumacher & Ifenthaler, 2018). Students who apply their learning more effectively from online courses have a higher success factor (Sandeen, 2013). The application of MOOCs in higher education proved to be the most promising integration for the future (Johnson, et al., 2016). Although MOOCs are widely accepted, much remains to be done as the participants' overall retention rates for MOOCs are very low (Clow, 2013).

This situation requires in-depth research to determine critical factors that can help enhance the MOOCs retention rate, which is the focus of this study. For a successful MOOC program, it is important to understand the factors that motivate participants not only to register for the online course but also to complete it. Motivational factors include new skills, knowledge, the interest of the learners in the topics, career advancement, supplement to a credit-bearing course, and professional development (Zheng, Rosson, Shih, & Caroll, 2015). These stimuli may cause someone to register for a course, but the problem arises when one fails to finish the course s/he has enrolled in (Howarth, D'Alessandro, Johnson, & White, 2016). Failing to do so lowers the online course retention rate. Recently, 13000 students registered for MOOCs at the Coursera platform in 61 different courses. The completion rate was observed to be just above 6% showing the actual rate of MOOC retention. Although this number is increasing over time, there are still many obstacles to overcome (Onah, Sinclair, & Boyatt, 2014). The rapid growth of MOOCs in recent years has given us the opportunity for further empirical research (Deng, Benckendorff, & Gannaway, 2019). The purpose of this paper is to investigate the critical factors responsible for enhancing participant's MOOC retention. An increase in the completion rate can be defined as the success of the MOOC (Pursel, Zhang, Jablokow, Choi, & Velegol, 2016). For this purpose, based on extensive literature review and discussion with participants the factors we narrowed down to be studied include i.e. instructor's role, learning outcomes, and course relevancy. A survey conducted by participants from Pakistan who have taken online courses using social media interactions that help us analyze the variables particularly the mediating role of social media (IT).

### Purpose of the Study

With the global spread of COVID-19, the world has realized the importance of rather an effective way of learning in the form of MOOCs due to the suspension of face-to-face classes and that is why the application of MOOCs has multiplied in the current scenario. The assimilation of MOOCs in higher education has made learning easy and effective for students and professionals. Although MOOCs have a broad application prospect, much remains to be done as the participants' overall retention rates for MOOCs are very low. The purpose of this paper is to investigate the critical factors responsible for enhancing participant's course retention in MOOC. Although previous research on MOOCs investigated the different factors for retention of courses this paper seeks to address a gap in the research by exploring the role of social media specifically in the perspective of Pakistan during COVID-19. This paper investigated the mediating role of IT (Social Media) with the instructor's role, learning outcomes, and course relevancy. Our research shows that the use of Social Media in MOOCs serves the purpose and enhances the performance of the students in terms of course retention, especially in crises like COVID-19. Our purpose and research questions lead to two research objectives: 1). How do the instructor, course relevancy, and learning outcome affect MOOCs retention? 2). How do social media facilitate course instructor interactions with MOOCs participants, sharing relevant and meaningful course materials and MOOCs retention?

## LITERATURE REVIEW

Massive Open Online Courses (MOOCs) are defined as the courses available to a large number of people over the internet. MOOCs can be introduced in the sense that nowadays they are seeking a lot of attention as a topic for academic research (Kovanovic, Joksimovic, Gasevic, Siemens, & Hatala, 2015). Traditional courses are mainly reduced to limited students, limited exposure, limited area, and fairly higher costs in the majority of the cases (Zhang, Huang, Lv, Liu, & Zhou, 2018). In the same way, another obstacle to overcome in organizing traditional courses is to ensure that the number of students is sufficient to pursue a certain subject; on the contrary, the course is not offered (Virta, Hokka, Etelaplto, & Rasku-Puttonen, 2019). In comparison, MOOCs have unlimited capacity and are considered to be the most flexible forms of education in the world since 2012 due to their easy access to everyone in the world (Sandeen, 2013). The year 2012 is called the year of MOOC (Bohnsack & Puhl, 2014). The reason is its wider and easy platform which provides better learning opportunities (Stokes, Towers, Jinks, & Symington, 2015). Many of the platforms are free and can be accessed at any time such as Coursera, edX (Wiley, Green, & Soares, 2012). Based on such wide exposure, the bar of expectation of teacher and student relationship has been raised to a greater extent. Due to such exposure, the rate of registration in recent years is relatively recorded higher but those who follow the courses to completion are less (Li, Tang, Cao, & Hu, 2018).

There is a lack of research to determine the reasons for the fall of many students/participants during an online course. The existing literature mainly focuses on the number of students registered for MOOCs instead of completion rates. The bioelectricity of autumn 2012 is an example of the enrolled students, i.e. more than 12,000 students who obtained the certificates or had taken the course could not even go up to one hundred (Rivard, 2013). Similarly, in another MOOC course named CCK08, more than two thousand students registered, another example of massive participation in a MOOC (McAuley, Stewart, Siemens, & Cormier, 2010). Searching for reasons and causes of improvement in the retention of courses creates a research gap and a must investigate topic (Engle, Mankoff, & Carbrey, 2015). Xiong, et al, (2015) concluded that students with increased inspiration, goals, and inclination to learn new skills and knowledge tend to contribute more to the completion of MOOCs. For this purpose, this research after a vigorous literature review and consultation with the participants who registered for online courses has narrowed down the most critical factors which include the instructor's role, learning outcomes, and course relevancy as well as the significant role of social media as a mediator.

## Instructor's Role and MOOC Participant Retention

Instructors are responsible for integrating online resources to organize learning content, creating a high-quality online learning environment that stimulates and enhance students' motivation to learn (Yount & Tandoh, 2016). Instructors become facilitators when they encourage, lead and challenge their students by giving them freedom and awareness, rather than a traditional speaker who focuses on teaching (Huynh, 2005). An instructor provides advice and feedback to the course participants about their learning practice and achievement and it is "one of the most influential elements in the learning process" (Dick, Carey, & Carey, 2005). The main purpose of the instructor's feedback is to enhance student performance by letting them know how well they are doing and directing them in their learning efforts. Feedback from the instructor in the web system includes the simplest cognitive response (for example, marking wrong answers in the quiz/assignment), diagnostic feedback (for example, quiz /assignment with the instructor's explanation explaining why the answers are good or bad), normative comments (suggestions from the instructor on how the correct answers can be developed) via respondents' responses by e-mail, rated work with notes, online notebooks, synchronous and asynchronous comments. If the instructor provides appropriate and effective feedback after each course, quiz, assignment, etc., it creates a sense of belonging among the students and they are keen to complete the course (Adamopoulos, 2013). Sometimes the instructor performs the function of a facilitator in a MOOC. S/He usually provides necessary tools, skills, and materials to the students to follow and in this way, students develop a stronger connection with the instructor as well as with the course (Zheng, Han, Rosson, & Carroll, 2016). Course participants do not know much about the subject, whether they apply it correctly in a desirable way or not, it is the feedback and the interaction with the instructor that will probably be most useful for the retention of the course. So, it can be hypothesized that.

H1: The instructor's role (feedback and interaction with students) has a positive effect on MOOC retention.

### Learning Outcomes and MOOC Participant's Retention

Learning outcomes are defined as "the learning of skills and knowledge" when a student or a professional pursues an online MOOC. There are two components of learning outcomes. The first one is "Digital literacy which is defined as the ability to use a computer, using online information while creating and managing online information" and the second is a practical implementation of secondary learning from MOOCs (which is digital skills). MOOCs retention rates significantly depend upon these two components. The learning capability of a participant is increased when s/he passes in a MOOC. Its effects are most noticeable when these skills are applied in real-life Fidal, et al, (2014). While pursuing MOOC, participants learn to access different online websites to learn and then they apply both of their learnings (MOOC specific and digital literacy) in their real life, professional career, or even in their academics (Waston, et al, 2016). MOOCs with the greater potential to teach digital skills to gain higher interest from students and thus have a higher retention rate (Viswanathan, 2012).

It can be stated that.

H2: Learning outcomes (digital skills and applications in real life) have a positive effect on MOOC participation retention.

### Course Relevancy and MOOC Participant Retention

It is generally believed that online learning and online courses do not have relevant stuff in them. Relevancy of course material with the MOOC's course plays a bigger role in MOOC retention. Students and participants registering for MOOCs hope for good-quality material related to the course which is relatively easy to understand and implement. A MOOC should have rather a flexible course material that can be easily understandable for everyone alike (De, Isabella, Morgan, & Gibson, 2015). Furthermore, for a MOOC to be successful, its course materials should possess deeper learning. In other words, the course curriculum must be in line with learning outcomes for the students to understand efficiently and develop their skills accordingly (Paton, Fluck, & Scanlan, 2018). In this way, the participants develop interest and their motivation to pursue the MOOC until its completion increases (Breslow, Pritchard, DeBoer, & Stump, 2013). Students participate in online courses with more willingness and motivation when course content is relevant, appealing, and comparatively of high quality (Bocchi, Eastman, & Swift, 2004). So, it can be stated that,

H3: Course relevancy (flexible and deeper learning material) has a positive effect on MOOC retention.

### IT (Social Media) and MOOC Participant Retention

Information technology is the backbone of massive open online course platforms. Access to the world through technology involves different perspectives or platforms on which social media has greater leeway. Social media can help engage MOOC students. The main reason is that majority of the young generation is attracted to social media and mostly gets their news and information based on materials available there. That is why MOOCs via social media can do wonders and help improve the overall retention rate (Ripiye, Bacon, Mackinnon, & Walker, 2017). Researchers have found a positive relationship between social media, teaching, and learning (Manca & Ranieri, 2017). The instructors can create official Facebook pages, Schoology, WhatsApp groups, etc. to interact with their students. The instructor can use social media websites such as YouTube, Google Drive, etc. to post and share relevant information and material and can provide feedback to the students using online blogs. In this way, students will be more attracted to MOOCs and have positive emotions towards MOOCs (Zheng, Han, Rosson, & Carroll, 2016). This study also concludes that social media is a better place for interpersonal communication, discussion, and quick collaboration. So, it can be stated that.

H4: IT (social media) positively affects MOOC participant retention.

### The Mediating Role of IT-Instructor Role and MOOC Participant Retention

The most important impact of MOOC participant retention is the role of a teacher or instructor.

In the current pandemic (COVID-19) situation instructors provide feedback to address students' queries via social media tools such as WhatsApp groups, Microsoft Teams, ZOOM, and/or Facebooks pages and groups. Instructors can make a course boring or interesting, depending on the teaching method they follow. Assignments and relevant activities given by the instructor directly affect the motivation of the students to take a specific course. The instructor's cooperation is an important factor that influences student motivation. It simply depends on how the instructor manages relationships with his/her peers using information technology (social media). A good instructor will always strive to reach students easily and effectively (Foroughi, 2016). A good instructor with proper feedback and a discussion with students has a positive impact and vice versa (Ross, Sinclair, Knox, Bayne, & Macleod, 2014). Inoculated with the interrelationships of the educational goals of the educator, encapsulations that represent the teacher and the relationships of the students and their personalities are what defines the role of the instructor in the retention of the MOOC (Coates, 2017). So, it can be stated as.

H5: IT (Social Media) mediates the effect of Instructors role on MOOC participation retention

### The Mediating Role of IT-Learning Outcomes and MOOC Participant Retention

The effectiveness of a MOOC can be derived from the fact that it contributes a lot to the learning of students and participants. The major interest of a student enrolling in a MOOC lies in his learning outcomes as s/he aims to learn something from it. As mentioned above, the more the younger generation interacts with the IT using social media, the more they can seize the opportunity to learn and retain the course (De, Isabella, Morgan, & Gibson, 2015). The findings of a study show that learning outcomes are dependent upon the learning specialty of a MOOC. Researchers have even suggested that the MOOC can end traditional learning and that anyone from around the world can access it online via social media (Breslow, Pritchard, DeBoer, & Stump, 2013). Another study highlighted the importance of learning outcomes from MOOCs through various factors and concluded that by fundamental and widely approved structures, measures should be used to benchmark quality beyond global boundaries, thus ensuring that all learning objectives are achieved (De, Isabella, Morgan, & Gibson, 2015).

Keeping in mind the points, it can be stated as.

H6: IT mediates the relationship between Learning outcomes and MOOC participants' retention.

### The Mediating Role of IT-Course Relevancy and MOOC Participant Retention

The course-relevancy refers to the relevance of course content and learning materials to the academic or work-related tasks of the participants. Course relevancy significantly contributes to MOOC participant retention. While registering for a MOOC, a participant is interested in the course material that is being taught in a MOOC. For this purpose, relevant course materials within the scope of the course contributing to deeper learning can attract students. Participants' attachment to technology and easy access to course materials, tutorials, exercises, quizzes, homework, etc. can motivate them to stay till the completion of the course (Crossley, Dascalu, McNamara, Baker, & Trausan-Matu, 2017). More than 90% of students and participants drop out because of irrelevant and insufficient content, which does not reinforce their confidence in the course (Hew, 2016). The availability of course content/material via social media and the learning of course materials by participants is important in terms of course retention (Hood, Littlejohn, & Milligan, 2015). Based on the above-mentioned literature it can be stated as;

H7: IT (Social Media) mediates the relationship between Course relevancy and MOOC participants' retention.

Based on the above-proposed hypotheses, the main framework that is to be evaluated in this study is given in the following figure number 1. The conceptual framework is based on the fact to evaluate the driving factors that can increase MOOC retention and enable students/personnel to continue with the MOOC until the completion stage.

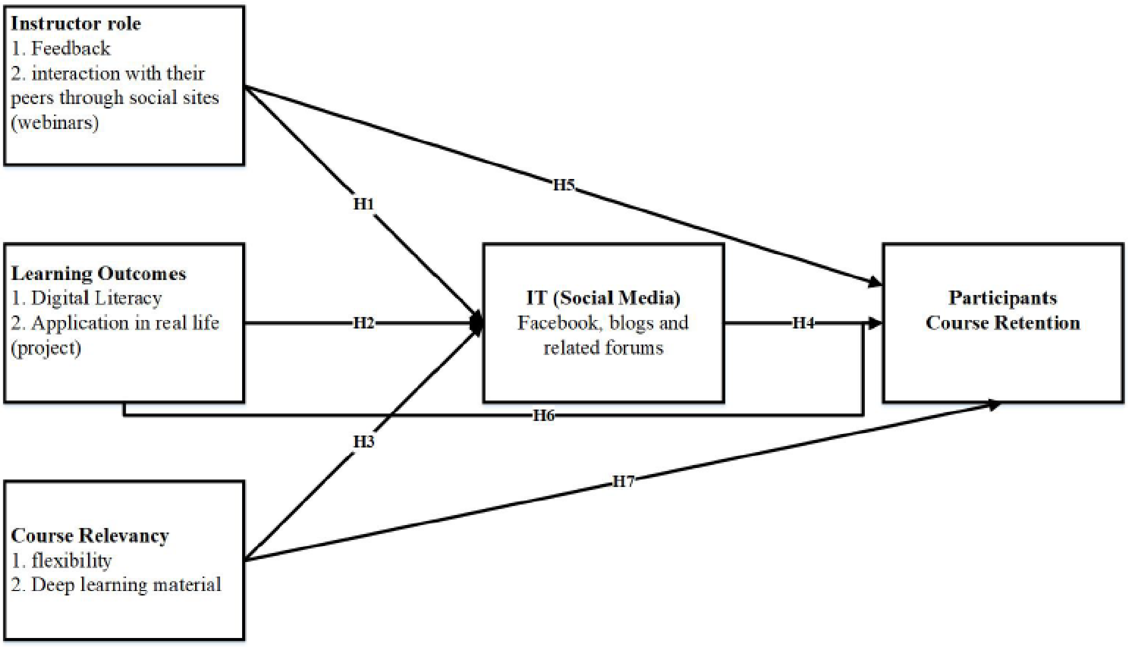


**Figure 1.** Conceptual Model

# METHODOLOGY

## Participant Selection

A well-design questionnaire was sent out to participants. Most of the participants included people who took online courses and used social media, especially Facebook and WhatsApp groups for interaction. Individuals from different industries who took online courses for their personal and technical training also participated in the survey. A questionnaire was sent out to more than 1000 participants registered on Coursera, edX, and Facebook platforms. Approximately 300 of them responded to the survey, giving an insight into the variables that may have a greater impact on MOOC retention. The questionnaire included questions related to the demographics of the participants which were kept anonymous and purely for research purposes. The demographics of the participants include their age, profession, and level of education. The second section included questions on the impact of the instructor's role on MOOC retention, i.e. the Independent variable of the research model adopted from (Viswanathan, 2012). The third section included questions based on the effect of learning outcomes on MOOC retention adopted from (Fidalgo-Blanco, Sein-Echaluce, Garcia-Penalvo, & Escano, 2014). The fourth section was based upon the course relevancy of a course being taught in MOOC adopted from (Akcaoglu & Bowman, 2016). Lastly, the final section included questions related to the information technology (IT) as being a mediator adopted from (Wu & Chen, 2017). MOOC retention is the dependent variable in this study and adopted from (Watted & Barak, 2018).

## Data Analysis

To explore the psychometric validity of the survey construct we used structural equation modeling (SEM). For EFA we used SPSS 25.0 and for CFA AMOS 24.0.

### Exploratory Factor Analysis

In this study, we applied EFA to ensure that all the measurements items load into their respective value limits. Table1 describes the factor loading of the constructs and shows that all the items are loaded in their respective constructs. However, LO3 had multiple cross-loading in the results which have been deleted from the list. Table1 shows, Cronbach's alpha ranging from .860 to .951 and are above the benchmark value of 0.70 (Liu, Ke, Wei, & Hua, 2013) and shows a satisfactory convergent validity of the measurements.

## Confirmatory Factor Analysis

We used AMOS 24.0 to analyze CFA for this we load all the items in a single factorindicating one-dimensionality. CFA deals with the appropriate reliability measurement method for theoretical construct space (Chin & Todd, 1995). First, we assess convergent validity (CR) and then compare the item load with the recommended minimum value of 0.60 (Chin, Gopal, & Salisbury, 1997). Further, we assessed the average variance extracted (AVE) representing the internal consistency of the indicators measuring in the given construct (see Table1 and 2).

Table 1: Exploratory and Confirmatory Factor Analysis

| Items | Loading | | | | | KMO and Sig | Eigenvalue & % of variance | Alpha | Loading | t-value | CFA results | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | | | | | | | |
| IR1 | .608 | | | | | .754 Sig=.000 | 64.679 | .860 | .560 | 8.042 | 0.87 | 0.58 |
| IR2 | .647 | | | | | | | | .574 | 8.287 | | |
| IR3 | .807 | | | | | | | | .566 | 8.151 | | |
| IR4 | .826 | | | | | | | | .444 | 6.217 | | |
| IR5 | .710 | | | | | | | | .421 | 5.860 | | |
| LO1 | | .802 | | | | .764 Sig=.000 | 69.228 | .899 | .498 | 7.051 | 0.89 | 0.63 |
| LO2 | | .860 | | | | | | | .472 | 6.635 | | |
| LO3 (deleted cross-loading >0.4) | | .435 | | | | | | | .632 | 9.279 | | |
| LO4 | | .697 | | | | | | | .562 | 8.077 | | |
| LO5 | | .900 | | | | | | | .472 | 6.641 | | |
| CR1 | | | .678 | | | .818 Sig=.000 | 68.410 | .883 | .619 | 9.049 | 0.88 | 0.60 |
| CR2 | | | .665 | | | | | | .583 | 8.440 | | |
| CR3 | | | .819 | | | | | | .604 | 8.790 | | |
| CR4 | | | .814 | | | | | | .622 | 9.096 | | |
| CR5 | | | .701 | | | | | | .639 | 9.395 | | |
| SM1 | | | | .786 | | .909 Sig=.000 | 74.669 | .951 | .766 | 11.802 | 0.94 | 0.69 |
| SM2 | | | | .745 | | | | | .812 | 12.768 | | |
| SM3 | | | | .765 | | | | | .807 | 12.671 | | |
| SM4 | | | | .719 | | | | | .832 | 13.206 | | |
| SM5 | | | | .704 | | | | | .775 | 11.988 | | |
| SM6 | | | | .863 | | | | | .828 | 13.121 | | |
| SM7 | | | | .886 | | | | | .804 | 12.594 | | |
| SM8 | | | | .851 | | | | | .797 | 8.960 | | |
| PCR1 | | | | | .769 | .743 Sig=.000 | 82.919 | .897 | .690 | 10.327 | 0.89 | 0.74 |
| PCR2 | | | | | .823 | | | | .631 | 9.258 | | |
| PCR3 | | | | | .789 | | | | .578 | 8.344 | | |

Note: LO3 deleted due to cross-loading

All estimates are significant

All estimates are above 0.4 and most above 0.7

AVE for all constructs above 0.5

CR for all constructs above 0.7

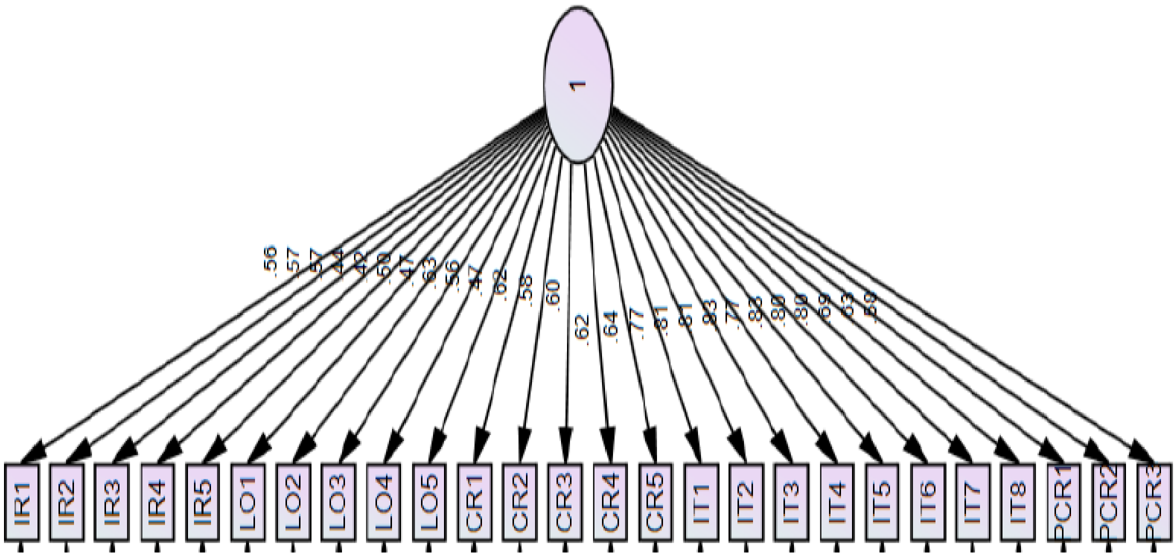


**Figure 2.** one construct loading

**Table 2.** Model Validity Measures

| | CR | AVE | IR | LO | CR | SM | PCR |
|---|---|---|---|---|---|---|---|
| **IP** | 0.874 | 0.587 | **0.766** | | | | |
| **LO** | 0.894 | 0.636 | 0.421*** | **0.798** | | | |
| **CR** | 0.883 | 0.605 | 0.550*** | 0.410*** | **0.778** | | |
| **SM** | 0.948 | 0.696 | 0.456*** | 0.409*** | 0.601*** | **0.835** | |
| **PCR** | 0.897 | 0.745 | 0.506*** | 0.385*** | 0.561*** | 0.626*** | **0.863** |

*p < 0.050, ** p < 0.010, *** p < 0.001

Note: No validity concerns here

Table 2 shows the multi-collinearity test by indicating all the values above the benchmark values of 0.60. Whereas, the value of AVE is >0.50 (Huang, Wang, Wu, & Wang, 2013). The rule of thumb to judge the existence of multicollinearity is if the variance inflation factor (VIF) and >10 or <0.10. Our results show that the highest VIF is 1.795 and the lowest VIF is 1.440, thus, multi-collinearity did not seem to be a problem.

## Model Fit Indices and Hypothesis Testing

Table 3 shows the overall model of fitness among the variables mentioned in the research model of the study. The results show that Chi-square normalization by the degree of freedom (χ2/df) should be 1~3 our results shows that (χ2/df) is 2.170, which is in between the benchmark. Comparative Fit Index (CFI), Incremental Fit Index (IFI), and Normed Fit Index (NFI) should be above 0.90 (Bentler, 1983). Our results indicate 0.0918, 0.918, and 0.959 respectively showing the significant values as per criteria. The goodness of Fit

Index (FGI) should be above 0.80 the Table3 results shows a value for GFI is 0.805, which is above the benchmark (Browne & Cudeck, 1992). Similarly, the commonly accepted value of root means the square error of approximation (RMSEA) should be less than 0.08, for the current model RMSEA is 0.07 showing a significant value to support the model.

**Table 3.** Model Fit Indices of the CFA Model

| Index | Index value | Criteria | References |
|---|---|---|---|
| Absolute fir measures | | | |
| $\chi 2$ | 611.930 | | (Bagozzi, Yi, & Nassen, 1998) |
| $\chi 2$/ degree of freedom | 2.170 | Between 1~3 | |
| GFI | 0.805 | ≥0.8 | (Browne & Cudeck, 1992) |
| RMSEA | 0.07 | ≤0.08 | |
| Incremental fit measures | | | |
| CFI | 0.918 | ≥0.9 | (Joreskog & Sorbom, 1996) |
| NFI | 0.959 | ≥0.9 | |
| IFI | 0.918 | ≥0.9 | |
| Parsimonious fir measure | | | |
| PNFI | 0.745 | >0.50 | (Ullman & Bentler, 2004) |
| PCFI | 0.796 | >0.50 | |

## Hypotheses Testing

Table 4 represents hypotheses testing. The authors predicted that the Instructor role, learning outcomes, and Course relevancy are related to social media. The results ($\beta$=.456, P<0.001), ($\beta$=.409, P<0.001), and ($\beta$=.601, P<0.001), show the positive relationship among these variables and support H1, H2, and H3. Moreover, the authors also predicted that IT is positively related to participants' course (MOOC) retention, for this prediction, table 4 shows that ($\beta$=.626, P<0.001) and shows a positive relationship to support the H4.

Furthermore, the study predicted that instructor role, learning outcomes, and course relevancy are positively related to participant course retention. The results ($\beta$=.506, P<0.001), ($\beta$=.385, P<0.001), and ($\beta$=.561, P<0.001) indicate that H5, H6, and H7 are positively supported.

**Table 4.** Hypothesis Testing

| | Estimates | t-value | P | Label |
|---|---|---|---|---|
| F1<--->F4 (H1) | .456 | 4.623 | 0.001 | Support |
| F2<--->F4 (H2) | .409 | 4.819 | 0.001 | Support |
| F3<--->F4 (H3) | .601 | 5.958 | 0.001 | Support |
| F4<--->F5 (H4) | .626 | 6.225 | 0.001 | Support |
| F1<--->F5 (H5) | .506 | 4.801 | 0.001 | Support |
| F2<--->F5 (H6) | .385 | 4.461 | 0.001 | Support |
| F3<--->F5 (H7) | .561 | 5.537 | 0.001 | Support |

Table 4 shows that instructor role, learning outcomes, and course relevancy have a positive influence on participant's course retention. We argue that IT (social media) has a positive mediating role between these variables.

Table 5 shows the direct and indirect effect of instructor role on participant's course retention. The results show that IR is positively related to social media where (β= .477). Furthermore, the tables show a positive relation between instructor role and IT (β= .488) and finally a positive mediating role of social media by showing the total effect of (β= .221). See figure 3

**Table 5.** Coefficients for the mediating effect (LO→SM→PCR)

| Testing paths | β | SE(β) | 95% CI | β | Sr² |
|---|---|---|---|---|---|
| Path c: DV= Participants Course Retention | | | | | |
| $R^2$= .160, F(1, 35,305) = , p= .000 | | | | | |
| IV= Learning Outcome | .438 | .074 | .292, .583 | .339 | 15.92% |
| Path a DV = Social media | | | | | |
| $R^2$= .184, F(1, 41.941) = , p=.000 | | | | | |
| IV = Learning Outcome | .441 | .068 | .307, 576 | .429 | 18.40% |
| Path b and c DV= Participants Course Retention | | | | | |
| $R^2$= /362, F(2, 52.582) = , p<0.000 | | | | | |
| IV: = Learning Outcome | .203 | .071 | .063, .344 | .186 | 2.82% |
| IV = Social Media | .532 | .069 | .395, .668 | .499 | 24.90% |
| Total a*b | | | | .214 | |

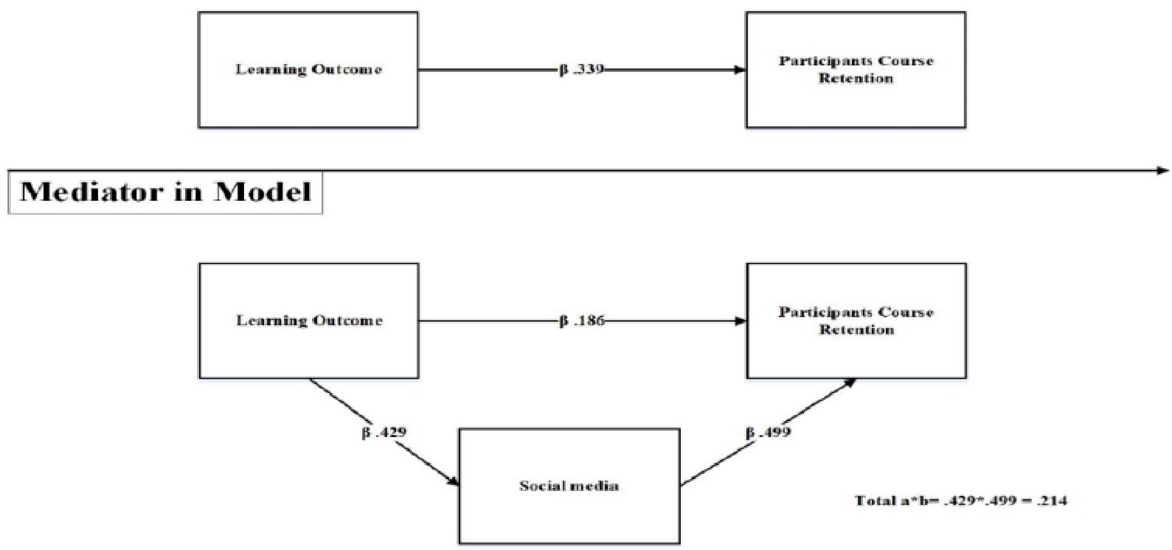


**Figure 3.** Model 3

Table 6 shows the direct and indirect effect of learning outcome (LO) on participant course retention (PCR). The table represents a positive direct relationship between LO and PCR (β = .339) and a positive relationship between LO and IT (social media) (β = .429). These results indicate the partial mediating effect of IT between LO and PCR (β= .214) see firgure4

**Table 6.** Coefficients for the mediating effect (LO→IT→PCR)

| Testing paths | β | SE(β) | 95% CI | β | $Sr^2$ |
|---|---|---|---|---|---|
| Path c: DV= Participants Course Retention | | | | | |
| $R^2$= .160 , F(1, 35,305) = , p= .000 | | | | | |
| IV= Learning Outcome | .438 | .074 | .292, .583 | .339 | 15.92% |
| Path a DV = IT-Social media | | | | | |
| $R^2$= .184 , F(1, 41.941) = , p=.000 | | | | | |
| IV = Learning Outcome | .441 | .068 | .307, 576 | .429 | 18.40% |
| Path b and c DV= Participants Course Retention | | | | | |
| $R^2$= /362 , F(2, 52.582) = , p<0.000 | | | | | |
| IV: = Learning Outcome | .203 | .071 | .063, .344 | .186 | 2.82% |
| IV = IT-Social Media | .532 | .069 | .395, .668 | .499 | 24.90% |
| Total a*b | | | | .214 | |

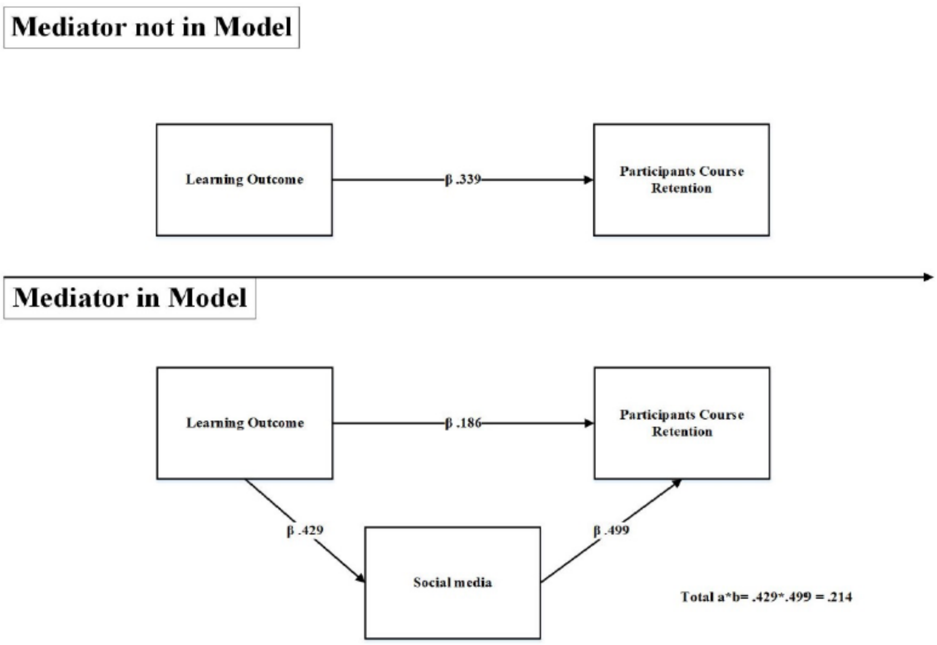


**Figure 4.** Model 4

Table 7 represents the relationship between course relevancy (CR) and PCR. The results indicate that CR has a positive relation with PCR (β= .541), which indicates that IT has a partial mediating effect between CR and PCR. Moreowver, the results indicate the positive relation between CR and IT (β.594) and a positive partial mediating role of SM (β= .235) see figure5

Table 7. Coefficients for the mediating effect (CR→IT→PCR)

| Testing paths | β | SE(β) | 95% CI | β | Sr² |
|---|---|---|---|---|---|
| Path c: DV= Participants Course Retention | | | | | |
| $R^2$= .292 , F(1, 109.319) = , p= .000 | | | | | |
| IV= Course Relevancy | .588 | .067 | .456, .721 | .541 | 29.26% |
| Path a DV = IT-Social media | | | | | |
| $R^2$= .352 , F( 1, 101.193) = , p=.000 | | | | | |
| IV = Course Relevancy | .606 | .060 | .487, .725 | .594 | 35.28% |
| Path b and c DV= Participants Course Retention | | | | | |
| $R^2$= .395 , F(2, 73.755) = , p<0.000 | | | | | |
| IV: = Course Relevancy | .332 | .077 | .179, .484 | .305 | 9.30% |
| IV = IT-Social Media | .423 | .067 | .274, .573 | .397 | 15.76% |
| Total a*b | | | | .235 | |

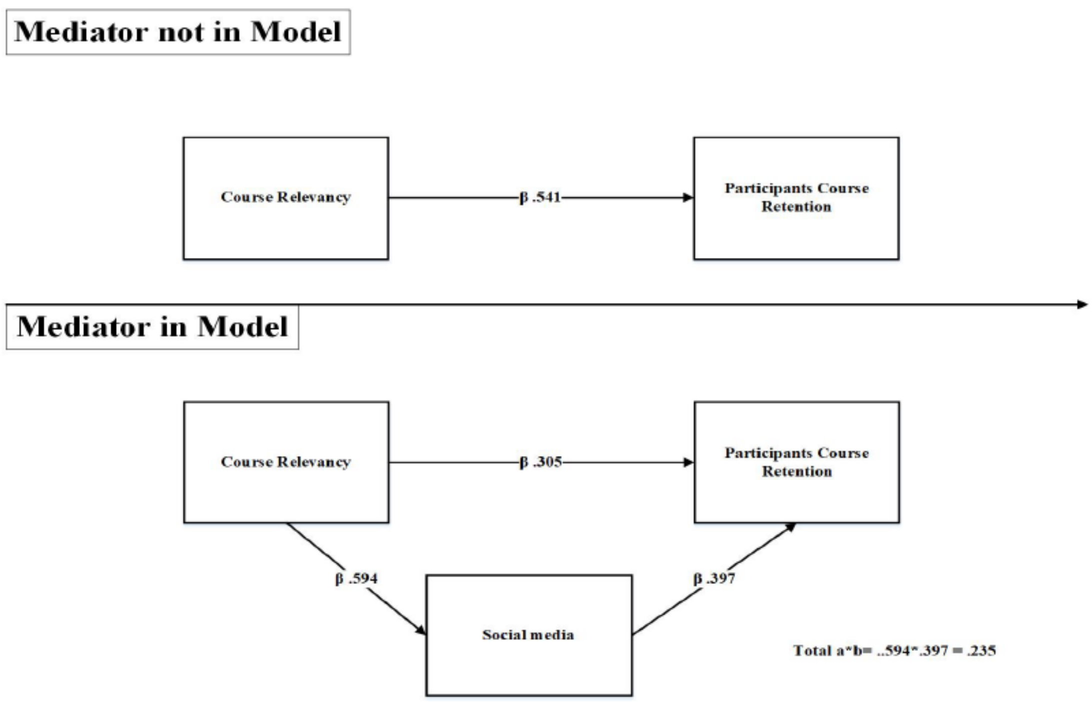


Figure 5. Model 5

Finally, Figure 6 shows the Total, Direct and indirect effects. We used SPSS to analyze the mediating effect of SM between IR, LO, CR, and PCR. We followed Andrew F. Hayes Process, which is used for estimating direct and indirect effects in single and multiple mediator models. We followed the 95% confidence intervals. The results in models 1, 2, and 3 show the positive total, direct, and indirect effect of IR, LO, and CR on PCR by mediating through IT-Social Media. These results further clarify the positive partial mediating effect of IT-Social Media.

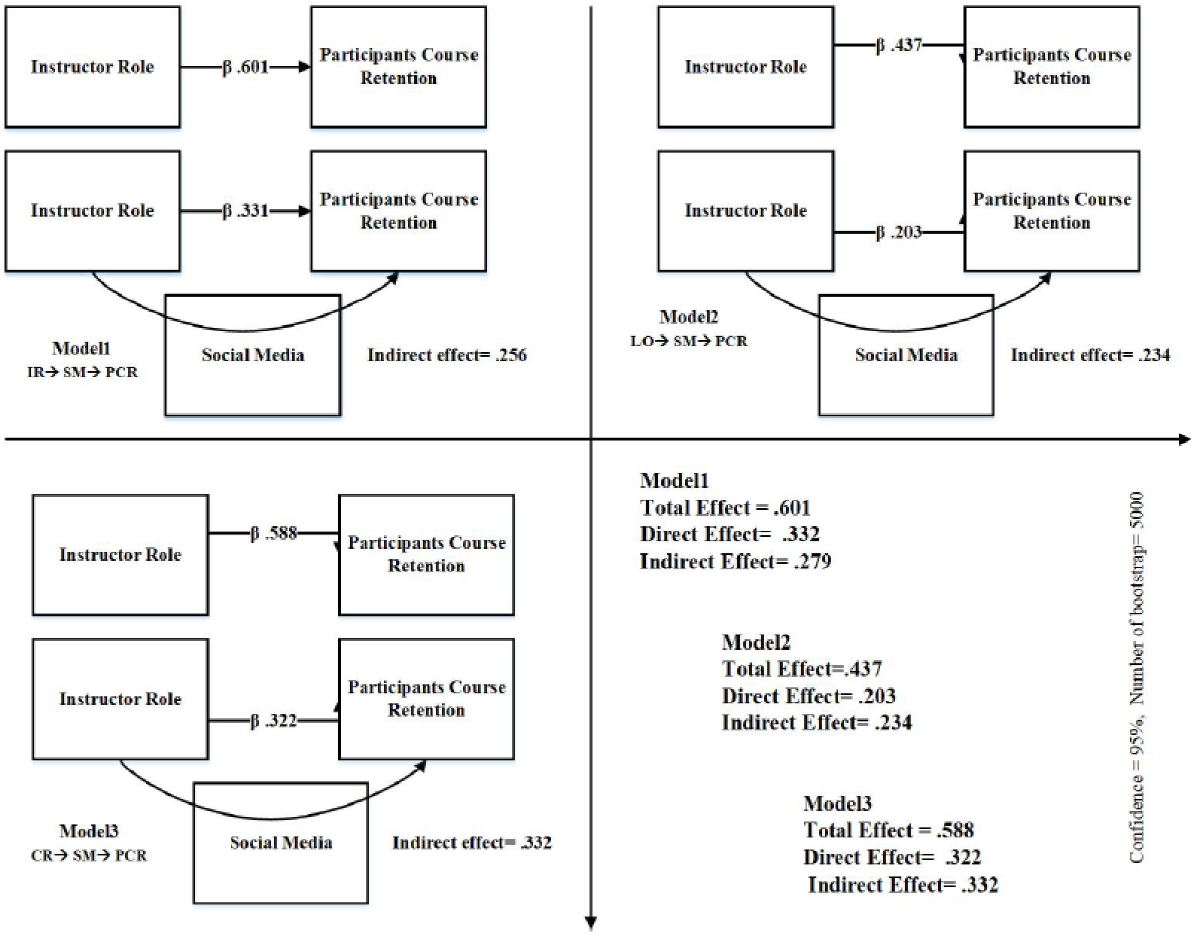


**Figure 6.** Total, Direct, and Indirect Effect

## DISCUSSION

This research study aimed to investigate critical factors responsible for the participant's MOOCs retention. The key factors responsible for this phenomenon include i.e. the instructor role, learning outcomes, course relevancy, and IT (Social Media). In this paper, we proposed a conceptual model which we empirically tested for its validation by data collected from respondents (university students and professionals). The results of the survey provided strong empirical support for all the proposed hypothesized relationships between the constructs. Figure 2 to Figure 6 highlight these significant relationships. The findings of this research are supported by and confirm those found in the existing literature such as (Hone & Said, 2016), (Babori, Fassi, & Zaid, 2019) and (Petronzi & Hadi, 2016) and show that a competent and cooperative instructor plays an important role in establishing a trusting relationship between both parties (Fouzia, 2018) and helping students learn new things or gain knowledge. Such sort of interaction with the instructor enhances MOOC retention. Institutions' strategic competitiveness depends on their strategic resources and capabilities which include human resources (Khan, 2020) such as competent and interactive instructors for a MOOC course. Higher educational institutions need the best leaders (instructors) and a collaborative atmosphere to motivate students for learning and to achieve fruitful academic outcomes in a competitive global environment (Akhtar, 2019). MOOCs Participants reported that they felt isolated and described being demotivated to continue because of low interaction, poor feedback, and communication with instructors.

Furthermore, poor communication and the lack of timely and clear feedback through social media platforms from the instructor can contribute to the participant's feelings of frustration. In their study (Baturay & Yukselturk, 2015) said that 35% of students reported their dissatisfaction because of the lack of interaction with the instructor.

For example:

“I did not continue with the Coursera course as I was demotivated due to poor instructor’s feedback”

“The instructor did not praise learners”

“The instructor didn’t engage us in discussions”

The second important variable discussed is learning outcomes, concerned with whether the participants can operate digital literacy (online learning) or not? And whether they can apply the knowledge gained through MOOCs in their real life? The answer to these questions probably is yes; students with higher knowledge of digital literacy are more likely to be successful in MOOC (online courses) and will have more intentions to apply all the knowledge practically. Existing literature such as (Tang & Chaw, 2016), (Prior, Mazanov, Meacheam, Heaslip, & Hanson, 2016), and (Hallaq, 2016) support these arguments highlighting the significant role that digital literacy plays in MOOC retention. Course relevancy is primarily concerned with whether students learn anything deeper in detail and the clarity of the contents being taught to the students. MOOC is an easy way for students to achieve their targets and learn new things quickly, but the question is how relevant is the course? Irrelevant course materials lead to increased participants’ dropouts. So, course relevancy has a positive effect on MOOC Learning and retention. Participants are excited about the course projects which they think will help to address real-life problems in their way. Relevant, related, and updated course contents such as textbooks, lecture materials, instructor’s feedback via social media would enhance participants’ knowledge and skills which in turn would improve their professional work, enhance job performance or promote their advancement in the workplace. Consequently, they would be encouraged to complete the course otherwise they leave it (Belanger and Thornton, 2013). Some common comments regarding course components of MOOCs include “the professor is a great teacher”, “the assignments were hard, but the lecture material was excellent and easy to follow”. That positive effect of course relevancy on MOOCs retention is also highlighted in existing literature such as (Greene, Oswald, & Pomerantz, 2015), (Baturay & Yukselturk, 2015), and (van, Williams, & Zirkle, 2016).

One of the important contributions of this paper includes the mediating role of social media. Social networking tools (Google, Facebook, WhatsApp, and Blogs, etc.) have become one of the strengths of effective MOOCs as they enhance informal interactions, exchange of ideas, and promote personal learning networks that have a significant impact on participants’ formal learning outcomes. However, less research is available on in-depth analysis of social media usage, the relationship of usage between a MOOC platform and social media, and the rationales of the usages from both instructors’ and students’ perspectives. This research is an endeavor to provide design principles for successful MOOCs platforms in the future and help teachers and participants make better use of social media to improve participants’ retention. Instructors use social media as an alternative channel to communicate with and provide timely and quick feedback to the participants. Research has shown that appropriate use of the social media tool could help engage students and improve their retention during the course (Baturay & Yukselturk, 2015; van, Williams, & Zirkle, 2016). Instructor using Google, Facebook, or WhatsApp groups to post announcements, promote course discussion, or share additional resources with MOOCs participants who can contribute to the discussion and share new resources. The results of this study also supported hypotheses regarding the mediating role of social media and confirm the same facts found by prior studies e.g. (Kaplan & Haenlein, 2016), (Toven-Lindsey, Rhoads, & Lozano, 2015), (Joksimovic, Gasevic, Kovanovic, Riecke, & Hatala, 2015). Existing literature (Lau & Roeser, 2002) also emphasizes that monitoring students’ activities online and encouraging them through timely feedback and interaction will more likely increase MOOCs retention. (Koller, Ng, Do, & Chen, 2013) also posit that in the absence of social media interactions, instructor’s feedback, and availability of relevant and easy to access course materials only 25% of the participants are expected to complete their online courses.

## CONCLUSION

MOOCs yield great individual and collective social benefits, as they offer the mode of instruction that overcomes several of the traditional obstacles in education, such as academic background and financial costs. Massive Open Online Courses (MOOCs) are one of the revolutions and experienced rapid development in education history. However, the low retention rate has become a major issue. The purpose of this research was to investigate the factors responsible for the improvement of MOOCs retention rates. After a rigorous literature review, the factors examined in this research include instructor role, course relevance, and learning outcomes. We also examined the mediating effect of social media between all the critical factors listed above and MOOC's retention. The findings of this research identified a significant positive effect of instructor feedback and interaction with students on MOOCs retention. Previous research studies, while, analyzing the impact of MOOC design features on dropout rate, found, amongst other results, that the interaction with the instructor had a substantial effect on the students' completion and continuation of the course (Charo, 2020), our results are consistent with the previous research. We also found a positive and significant impact of participants' digital literacy, flexible, related, relevant, and readily available course contents which they think will stent with the previous research have an impact on their job performance and professional learning on participants' MOOCs retention. Finally, we found that participants showed higher engagement and retention using social media tools such as WhatsApp or Facebook groups. Participants found these social media tools more convenient and better place for collaboration and interaction with course instructors and colleagues. Using social networking tools helps in cultivating a sense of community, creativity and enhancing students' retention.

This research effectively extends the findings of prior researchers. Generally, most of the researches conducted on MOOCs is based on the quantitative approach and they are only directed towards students. In the future, researchers can either opt for qualitative approaches or can actively target MOOCs designers, developers, and instructors to enhance the understanding of MOOCs. By doing so, researchers will be able to provide further novelty in this topic. In the current COVID-19 pandemic situation due to a halt in traditional classes, researchers can further investigate the role of organizational support in terms of IT, students' motivation, and perceived ease of using the online platforms offering MOOCs in developing economies.

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## REFERENCES:


Adamopoulos, P. (2013). What makes a great MOOC? An interdisciplinary analysis of student retention in online courses. *34th International Conference on Information Systems (ICIS).* Milano.

Akcaoglu, M., & Bowman, N. D. (2016). Using instructor-led Facebook groups to enhance students' perceptions of course content. *Computers in Human Behavior*, 65(1), 582-590.

Babori, A., Fassi, H. F., & Zaid, A. (2019). Research on MOOCs: current trends and taking into account of content. *Proceedings of the 2nd International Conference on Networking, Information Systems & Security*. Rabat.

Bagozzi, R. P., Yi, Y., & Nassen, K. D. (1998). Representation of measurement error in marketing variables: Review of approaches and extension to three-facet designs. *Journal of Econometrics, 89*(1-2), 393-421.

Baturay, M., & Yukselturk, E. (2015). The Role of Online Education Preferences on Student's Achievement. *Turkish Online Journal of Distance Education* , 16(3), 3-12.

Bentler, P. M. (1983). Some contributions to efficient statistics in structural models: Specification and estimation of moment structures. *Psychometrika*, 48(4), 493-517.

Bocchi, J., Eastman, J. K., & Swift, C. O. (2004). Retaining the online learner: Profile of students in an online MBA program and implications for teaching them. *Journal of education for Business*, 79(4), 245-253.

Bohnsack, M., & Puhl, S. (2014). Accessibility of MOOCs. *International Conference on Computers for Handicapped Persons*. Linz.

Breslow, L., Pritchard, D. E., DeBoer, J., & Stump, G. S. (2013). Studying learning in the worldwide classroom research into edX's first MOOC. *Research & Practice in Assessment*, 8(1), 13-25.

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological methods & research*, 21(2), 230-258.

Chin, W. W., & Todd, P. A. (1995). On the use, usefulness, and ease of use of structural equation modeling in MIS research: a note of caution. *MIS Quarterly*, 19(2), 237-246.

Chin, W. W., Gopal, A., & Salisbury, W. D. (1997). Advancing the theory of adaptive structuration: The development of a scale to measure faithfulness of appropriation. *Information systems research*, 8(4), 342-367.

Clow, D. (2013). MOOCs and the funnel of participation. *Proceedings of the third international conference on learning analytics and knowledge* . New York.

Coates, H. (2017). *The market for learning*. Singapore: Springer.

Crossley, S., Dascalu, M., McNamara, D. S., Baker, R., & Trausan-Matu, S. (2017). *Predicting success in massive open online courses (MOOCs) using cohesion network analysis*. PA: International Society of the Learning Sciences, Philadelphia.

De, F., Isabella, S., Morgan, J., & Gibson, D. (2015). Will MOOCs transform learning and teaching in higher education? Engagement and course retention in online learning provision. *British Journal of Educational Technology*, 46(3), 455-471.

Deng, R., Benckendorff, P., & Gannaway, D. (2019). Learner engagement in MOOCs: Scale development and validation. *British Journal of Educational Technology*, 0(0), 1-18.

Dick, W., Carey, L., & Carey, J. O. (2005). *The systematic design of instruction*. Florida: Florida state university.

Engle, D., Mankoff, C., & Carbrey, J. (2015). Coursera's introductory human physiology course: Factors that characterize successful completion of a MOOC. *International Review of Research in Open and Distributed Learning*, 16(2), 46-68.

Fidalgo-Blanco, A., Sein-Echaluce, M. L., & Garcia-Penalvo, F. J. (2014). Improving the MOOC learning outcomes throughout informal learning activities. *Proceedings of the second international conference on Technological Ecosystems for Enhancing Multiculturality*. Salamanca.

Fidalgo-Blanco, A., Sein-Echaluce, M. L., Garcia-Penalvo, F. J., & Escano, J. E. (2014). Improving the MOOC learning outcomes throughout informal learning activities. *Proceedings of the second international conference on Technological Ecosystems for Enhancing Multiculturality*. New York.

Foroughi, A. (2016). MOOCs: The Enduring Importance of" Teacher Presence". *Journal of Higher Education Theory and Practice*, 16(6), 76.

Hallaq, T. (2016). Evaluating online media literacy in higher education: validity and reliability of the Digital Online Media Literacy Assessment (DOMLA). *Journal of Media Literacy Education*, 8(1), 62-84.

Hew, K. F. (2016). Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS. *British Journal of Educational Technology*, 47(2), 320-341.

Hone, K. S., & Said, R. G. (2016). Exploring the factors affecting MOOC retention: A survey study. *Computers & Education*, 98(1), 157-168.

Hood, N., Littlejohn, A., & Milligan, C. (2015). Context counts: How learners' contexts influence learning in a MOOC. *Computers & Education*, 91(1), 83-91.

Howarth, J. P., D'Alessandro, S., Johnson, L., & White, L. (2016). Learner motivation for MOOC registration and the role of MOOCs as a university 'taster'. *International Journal of Lifelong Education*, 35(1), 74-85.

Huang, C.-C., Wang, Y.-M., Wu, T.-W., & Wang, P.-A. (2013). An empirical analysis of the antecedents and performance consequences of using the moodle platform. *International Journal of Information and Education Technology*, 3(2), 217-221.

Huynh, M. Q. (2005). Viewing e-learning productivity from the perspective of Habermas' cognitive interests theory. *Journal of Electronic Commerce in Organizations*, 3(2), 33-45.

Johnson, L., Becker, S. A., Cummins, M., Estrada, V., Freeman, A., & Hall, C. (2016). *NMC horizon report: 2016 higher education edition*. Texas: The New Media Consortium.

Joksimovic, S., Gasevic, D., Kovanovic, V., Riecke, B. E., & Hatala, M. (2015). Social presence in online discussions as a process predictor of academic performance. *Journal of Computer Assisted Learning*, 31(6), 638-654.

Joreskog, K. G., & Sorbom, D. (1996). *LISREL 8: User's reference guide*. Illinois: Scientific Software International.

Kaplan, A. M., & Haenlein, M. (2016). Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster. *Business Horizons*, 59(4), 441-450.

Koller, D., Ng, A., Do, C., & Chen, Z. (2013). Retention and intention in massive open online courses: In-depth. *Educause review*, 48(3), 62-63.

Kovanovic, V., Joksimovic, S., Gasevic, D., Siemens, G., & Hatala, M. (2015). What public media reveals about MOOC s: A systematic analysis of news reports. *British Journal of Educational Technology*, 46(3), 510-527.

Lau, S., & Roeser, R. W. (2002). Cognitive abilities and motivational processes in high school students' situational engagement and achievement in science. *Educational Assessment*, 8(2), 139-162.

Li, J., Tang, Y., Cao, M., & Hu, X. (2018). The moderating effects of discipline on the relationship between asynchronous discussion and satisfaction with MOOCs. *Journal of Computers in Education*, 5(3), 279-296.

Liu, H., Ke, W., Wei, K. K., & Hua, Z. (2013). The impact of IT capabilities on firm performance: The mediating roles of absorptive capacity and supply chain agility. *Decision support systems*, 54(3), 1452-1462.

Manca, S., & Ranieri, M. (2017). Implications of social network sites for teaching and learning. Where we are and where we want to go. *Education and Information Technologies*, 22(2), 605-622.

Onah, D. F., Sinclair, J., & Boyatt, R. (2014). Dropout rates of massive open online courses: behavioural patterns. *EDULEARN14 proceedings*. Barcelona.

Paton, R. M., Fluck, A. E., & Scanlan, J. D. (2018). Engagement and retention in VET MOOCs and online courses: A systematic review of literature from 2013 to 2017. *Computers & Education,* 125(1), 191-201.

Petronzi, D., & Hadi, M. (2016). Exploring the factors associated with MOOC engagement, retention and the wider benefits for learners. *European Journal of Open, Distance and E-learning*, 19(2), 112-129.

Prior, D. D., Mazanov, J., Meacheam, D., Heaslip, G., & Hanson, J. (2016). Attitude, digital literacy and self efficacy: Flow-on effects for online learning behavior. *The Internet and Higher Education*, 29(1), 91-97.

Pursel, B. K., Zhang, L., Jablokow, K. W., Choi, G. W., & Velegol, D. (2016). Understanding MOOC students: motivations and behaviours indicative of MOOC completion. *Journal of Computer Assisted Learning*, 32(3), 202-217.

Ripiye, P.-R., Bacon, L., Mackinnon, L., & Walker, S. (2017). The use of social media in MOOCs: A review of literature. *ECSM 2017 4th European Conference on Social Media*. Vilnius.

Rivard, R. (2013, March 8). *Inside higher ED*. Retrieved January 29, 2020, from Inside higher ED: https://www.insidehighered.com/news/2013/03/08/researchers-explore-who-taking-moocs-and-why-so-many-drop-out

Ross, J., Sinclair, C., Knox, J., Bayne, S., & Macleod, H. (2014). Teacher experiences and academic identity: The missing components of MOOC pedagogy. *MERLOT Journal of Online Learning and Teaching*, 10(1), 57-69.

Sandeen, C. (2013). Assessment's Place in the New MOOC World. *Research & practice in assessment*, 8(1), 5-12.

Sandeen, C. (2013). Integrating MOOCs into traditional higher education: The emerging "MOOC 3.0" era. *Change: The magazine of higher learning*, 45(6), 34-39.

Schumacher, C., & Ifenthaler, D. (2018). Features students really expect from learning analytics. *Computers in Human Behavior*, 78(1), 397-407.

Stokes, C. W., Towers, A. C., Jinks, P. V., & Symington, A. (2015). Discover Dentistry: encouraging wider participation in dentistry using a massive open online course (MOOC). *British Dental Journal*, 219(2), 81-85.

Tang, C. M., & Chaw, L. Y. (2016). Digital Literacy: A Prerequisite for Effective Learning in a Blended Learning Environment? *Electronic Journal of E-learning*, 14(1), 54-65.

Toven-Lindsey, B., Rhoads, R. A., & Lozano, J. B. (2015). Virtually unlimited classrooms: Pedagogical practices in massive open online courses. *The internet and higher education*, 24(1), 1-12.

Ullman, J. B., & Bentler, P. M. (2004). Structural equation modeling: *Handbook of Data Analysis. California: SAGE publishing*.

van, R., Williams, S., & Zirkle, K. (2016). Balancing pedagogy, student readiness and accessibility: A case study in collaborative online course development. *The Internet and Higher Education*, 28(1), 1-7.

Virta, J., Hokka, P., Etelaplto, A., & Rasku-Puttonen, H. (2019). Professional identity among student teachers of physical education: the role of physicality. *European Journal of Teacher Education*, 42(2), 192-210.

Viswanathan, R. (2012). Teaching and Learning through MOOC. *Frontiers of Language and Teaching*, 3(1), 32-40.

Viswanathan, R. (2012). Teaching and Learning through MOOC. *Frontiers of Language and Teaching*, 3(1), 32-40.

Wastson, S. L., Loizzo, J., Watson, W. R., Mueller, C., & Lim, J. (2016). Instructional design, facilitation, and perceived learning outcomes: An exploratory case study of a human trafficking MOOC for attitudinal change. *Educational Technology Research and Development*, 64(6), 1273-1300.

Watted, A., & Barak, M. (2018). Motivating factors of MOOC completers: Comparing between university-affiliated students and general participants. *The Internet and Higher Education*, 37(1), 11-2-.

Watted, A., & Barak, M. (2018). Motivating factors of MOOC completers: Comparing between university-affiliated students and general participants. *The Internet and Higher Education*, 37(1), 11-20.

Wiley, D., Green, C., & Soares, L. (2012). *Dramatically Bringing down the Cost of Education with OER: How Open Education Resources Unlock the Door to Free Learning*. Center for American Progress, Washington.

Wu, B., & Chen, X. (2017). Continuance intention to use MOOCs: Integrating the technology acceptance model (TAM) and task technology fit (TTF) model. *Computers in Human Behavior*, 67(1), 221-232.

Xiong, Y., Li, H., Kornhaber, M. L., Suen, H. K., Pursel, B., & Goin, D. D. (2015). Examining the relations among student motivation, engagement, and retention in a MOOC: A structural equation modeling approach. *Global Education Review*, 2(3), 23-33.

Yount, A., & Tandoh, K. (2016). *Teaching and Learning Online: An Examination of Effective Techniques, Practices, and Processes.* IGI Global, Muncie.

Yuan, L., & Powell, S. J. (2013). *MOOCs and open education: Implications for higher education*. The University of Bolton, Bolton.

Zhang, H., Huang, T., Lv, Z., Liu, S., & Zhou, Z. (2018). MCRS: A course recommendation system for MOOCs. *Multimedia Tools and Applications*, 77(6), 7051-7069.

Zheng, S., Han, K., Rosson, M. B., & Carroll, J. M. (2016). The role of social media in MOOCs: How to use social media to enhance student retention. *Proceedings of the Third (2016) ACM Conference on Learning@ Scale*. Edinburgh.

Zheng, S., Rosson, M. B., Shih, P. C., & Caroll, J. M. (2015). Understanding student motivation, behaviors and perceptions in MOOCs. *Proceedings of the 18th ACM conference on computer supported cooperative work & social computing*. New York.

# AN INVESTIGATION OF MATHEMATICS TEACHERS' EMERGENCY REMOTE TEACHING EXPERIENCES

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## ABSTRACT

With the confirmation of the coronavirus epidemic as a global pandemic, and with the suspension of face-to-face teaching and learning activities for all educational institutions, the concept of emergency remote teaching has come into prominence. As a process that affects a large number of students, the effective management of emergency remote teaching process has important effects on ensuring the sustainability of learning and students' well-being. It becomes an important issue to examine teachers' evaluations about their emergency remote teaching experiences. The purpose of this study was to examine the evaluations of mathematics teachers' emergency remote teaching experiences. The case study method was used and the participants consisted of 10 middle school mathematics teachers. The data were collected by semi-structured interviews. In the data analysis process content analysis method was used. As a result, it was seen that participating teachers' current understanding of the concept of distance education has influenced the way they conduct their online lessons. It was revealed that participating teachers carried out emergency remote teaching period in ways that they could transfer the face-to-face learning environment to online environment. Again, it was seen that mathematics teachers pointed to their lack of knowledge and skill about online learning.

**Keywords:** Emergency remote teaching, distance education, online lesson, coronavirus pandemic, middle school mathematics teacher.

## INTRODUCTION

In today's digital age, distance education is becoming increasingly important due to the rapid development of communication technologies and the ease of access to information. Distance education refers to the learning process in which learners are physically, educationally and psychologically distant from other learners and learning resources without boundaries of time and space (Anderson, 2003; Moore, 1989; Moore, 1993). Distance education is an educational model that gives the learner much of the responsibility for learning and learners are expected to have self-directed and self-management learning skills (Knowles, 1975). People with different characteristics and experience can easily receive effective training with modern methods by taking advantage of distance education environments (Rovai & Downey, 2010).

With the confirmation of the coronavirus (COVID-19) epidemic, which is effective worldwide, as a global pandemic, and with the suspension of face-to-face teaching and learning activities for all educational institutions, the concept of emergency remote teaching has come into prominence. Emergency remote teaching is about surviving in a time of crisis with all resources available, including offline and/or online (Bozkurt et al., 2020). In this regard, distance education and emergency remote teaching refer to quite different processes from each other. As a matter of fact, how to conceptualize emergency remote teaching and distinguish it from distance education are emphasized in the literature (e.g. Hodges, Moore, Lockee, Trust & Bond, 2020).

Despite the differences between distance education and emergency remote teaching, teachers have a fundamental role in conducting these processes effectively. Here, as can be seen from the emphasis on "teaching", the emergency remote teaching process is mainly conducted by the teachers (Hodges et.al., 2020). However, in the emergency remote teaching process, teachers are expected to be mediators and facilitators beyond imitating face-to-face lessons in online learning environments, and enable students to take a greater role in their own learning (Yildirim, 2020). Again, considering the effects of the crisis situation in the emergency remote teaching period, the teacher role as supporting students' well-being comes into prominence (Bozkurt & Sharma, 2020). During COVID-19 pandemic period, as the world is almost all, Turkey has also passed on quickly to the use of online classes. In Turkey, teachers' experience of emergency remote teaching period has been conducting the Education Information Network (Egitim Bilisim Agi-[EBA]) online lessons. The EBA platform offers teachers the option of conducting their online lessons and exams, video lectures, course contents and access to a large number of problems. EBA online lesson, on the other hand, refers to the online classroom practice where teachers and students can come together simultaneously via EBA (http://eba.gov.tr).

When the literature on emergency remote teaching is examined, it is seen that the studies on this subject are increasing day by day. In this context, there are many studies on differences between emergency remote teaching and distance education (e.g. Bozkurt & Sharma, 2020; Shisley, 2020; Whittle, Tiwari, Yan, & Williams 2020). Again, it is seen that many studies are encountered to examine the reflections of the COVID-19 pandemic in the field of education (e.g. Angoletto & Queiroz, 2020; Bozkurt, 2020; Burke & Dempsey, 2020; Iwai, 2020; Keskin & Ozer-Kaya, 2020; Yildirim, 2020). In these studies, it is seen that there are various discussions on the evaluation of the emergency remote teaching period. However, a limited number of studies are encountered to examine teachers' emergency remote teaching experiences (e.g. Albo, Beardsley, Martinez-Moreno, Santos & Hernandez-Leo 2020; Talidong, 2020; Trust & Whalen, 2020). For instance, Albo et.al. (2020) conducted a quantitative study with primary and secondary school teachers in Spain. The purpose of this study was to capture a snapshot of teachers' experiences in Spain during the emergency remote teaching. As a result of the study, it was observed that during the pandemic, teachers gained confidence in using a wide variety of technologies, however they thought that the digital divide among students and a lack of technical resources and support negatively affected the online education process. Again, Talidong (2020) conducted a quantitative study aiming to examine how Philippine teachers implemented the process of remote English language teaching among primary learners. As a result of the study, Philippine teachers are equipped with necessary preparations for emergency remote teaching in English language instruction. Likewise, they perceived emergency remote teaching as beneficial to continue the teaching and learning process. Kocoglu and Tekdal (2020) conducted a study aiming to analyze the educational activities conducted in Turkey during the pandemic. The findings revealed that, the teachers of various disciplines stated remarkable views on the education conducted during the COVID-19 pandemic.

With the suspension of face-to-face education during the COVID-19 pandemic period, 1.6 billion learners of all ages from around the globe are affected, from pre-primary to higher education. The number of students being affected by this situation in Turkey is about 25 million (UNESCO, 2020). At this point, considering the fact that emergency remote teaching is a process that affects a large number of students and the effects of effective management of this process on ensuring the sustainability of learning and students' well-being, it is an important issue to examine teachers' emergency remote teaching experiences. Again, examining teachers' experiences in this process will be valuable in terms of their contribution to the development of the EBA platform and conducting face-to-face education and distance education activities in the future. Indeed, Mulenga and Marban (2020) emphasize that without including teachers and their evaluations on the process, no paradigm change can be successfully reflected in educational settings. On the other hand, there seemed to be a lack of research focusing on mathematics teachers during this pandemic. Thus, this research is significant because it fills the gap on math teaching in distance education. In this context, the purpose of this study is to examine the evaluations of middle school mathematics teachers' emergency remote teaching experiences. In line with this general purpose of the study, the main questions explored in this study are:

1. How do middle school mathematics teachers evaluate their emergency remote teaching experiences?
   a. What meaning do middle school mathematics teachers ascribe to distance education?
   b. Is there a relationship between the middle school mathematics teachers' understanding of distance education and their emergency remote teaching experiences?
   c. Do middle school mathematics teachers' evaluations of their emergency remote teaching experiences differ according to the socio-economic environment in which they work?

## METHOD

In this study, it was aimed to examine the evaluations of middle school mathematics teachers' emergency remote teaching experiences. Since the phenomena investigated in this study was determined as the evaluations of the middle school mathematics teachers' experiences, a holistic single case study was chosen. Case study research generally depicts and helps the researcher to analyze and understand a phenomenon related to a specific group of people (Baxter & Jack, 2008; Bogdan & Biklen, 2007). Additionally, a case study approach "affords researchers opportunities to explore or describe a phenomenon in context using a variety of data sources" (Baxter & Jack, 2008, p. 544). Detailed information about the research process is given below.

### Participants

The participants of the study consisted of 10 middle school mathematics teachers who were determined by criterion sampling method (Yildirim and Simsek, 2018). The selection criteria was working in schools which located in different socio-economic environments. Therefore, different socio-economic environments in the central districts of Eskisehir were determined. In this context, four of the participating teachers (Su, Ali, Cansu and Gorkem) works in low socio-economic environments, three of them (Ugur, Emir and Emre) works in middle socio-economic environments and three of them (Ozge, Esra and Mert) works in high socio-economic environments. Here, all participant names have been changed to pseudonyms.

### Data Collection and Analysis

In this study, semi-structured interviews were conducted to examine the evaluations of mathematics teachers' emergency remote teaching experiences. In order to review the appropriateness and clarity of the interview questions, the opinions of an expert that held a doctorate degree in distance education was asked. Before collecting data for the main study, a pilot study was conducted with a voluntary middle school mathematics teacher who was not involved in the actual study in order to assess the clarity and comprehensibility of the semi-structured interview questions. As a result of the pilot study, sub-questions and the order of questions were modified and the final form of semi-structured interview questions was developed. The interviews were recorded using a voice recorder and each interview lasted nearly 30 minutes. The sample questions are presented in Table 1.

**Table 1.** Semi-structured interview sample questions

| Sample questions |
|---|
| - What does the concept of distance education mean? |
| - What are the advantages/disadvantages of distance education compared to face-to-face education? |
| - What are your views on the use of digital technologies in distance education? |
| - How do you conduct your online lessons? |
| - Which technology and materials do you use in your online lessons? |
| - How do you evaluate your effectiveness in conducting your online lessons? |

Semi-structured interview data were analysed through content analysis method. In content analysis, the data are gathered around similar concepts and themes, then interpreted in a way that the reader can understand (Creswell, 2014). In this context, firstly, codes were determined through reading the transcripts several times. Then, these codes were combined under certain categories and themes, then finalized as a result of the reliability study. During the reliability study, the researcher and an expert that held a doctorate degree in distance education studied independently and decided on the suitability of the codes and categories. In this context, the percentage of compliance between raters was examined by using the formula as [P = [Na/(Na + Nd)] x 100] (P: Percentage of Compliance, Na: Number of agreement, Nd: Number of disagreement) (Miles & Hubermen, 1994). The reliability between coders was calculated as 90%. Miles and Huberman (1994) suggest that an inter-rater reliability of 80% agreement between coders on 95% of the codes is sufficient agreement among multiple coders. Therefore, this value showed that the scores are consistent with each other. On the other hand, regarding the situations in which the researcher and the field expert had disagreement, an assist professor in the field of distance education was consulted and a consensus was reached. Finally, at the last step of the analysis the categories are interpreted in line with the purpose of the study.

## FINDINGS

Regarding the participants' evaluations about their emergency remote teaching experiences, five themes were determined as "the concept of distance education", "using digital technologies in distance education", "EBA online lessons", "shortcomings of EBA online lessons" and "expectations". In the analysis of the theme of the concept of distance education, two categories were identified. These categories consisted of: i) lessons in online environments and ii) emergency remote teaching. Three categories were identified across the interviews about use of digital technologies in distance education. These categories consisted of: i) use of the internet, ii) use of social media and iii) use of the video. In the analysis of the theme of EBA online lessons, two categories were identified. These categories included: i) use of technology and material, ii) interactions between learner and teacher. Under the theme of shortcomings of EBA online lessons, three categories were identified as i) lack of knowledge about online learning, ii) lack of interaction and iii) lack of technical resources. Lastly, the theme of expectations consisted of 'organizing in-service teacher trainings' category.

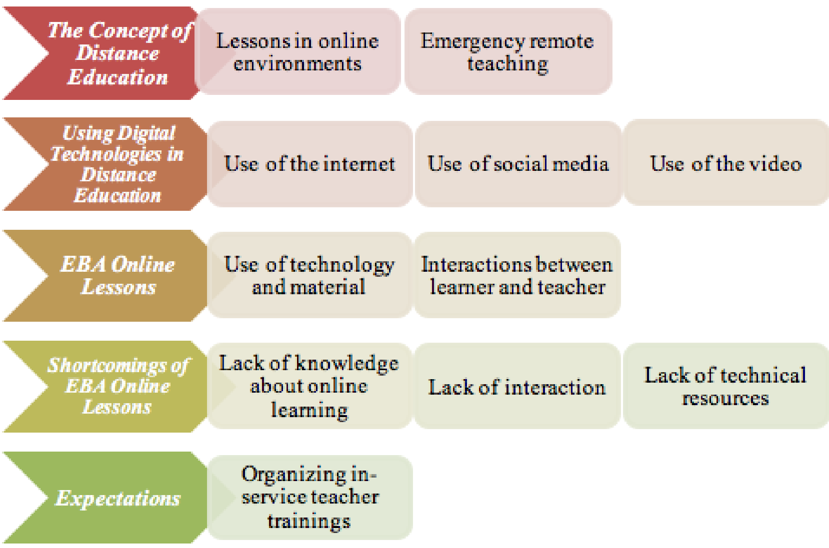


**Figure 1.** Themes and categories related to emergency remote teaching experiences

## The Concept of Distance Education

In semi-structured interviews, the question of "What does the concept of distance education mean?" was directed first. The answers obtained here showed that regardless of the socio-economic environment in which they work, most of the participants (seven out of 10 participants) thought that the expression of 'distance' refers only to physical distance between teacher and students. For instance, Emre stated that *"… the environment that allows teachers to transfer knowledge without being in the same physical environment with students"* and Mert stated that *"Distance education means digital learning environment"*. On the other hand, it was remarkable that the remaining three participants (Ugur, Esra and Gorkem) pointed to the meaning of emergency remote teaching. The views of the participants, which clearly respond to the emphasis on being an obligation and on the effort to keep education alive in crisis, are presented below.

> *Ugur: … a teaching process that is a compensation for the lack of face-to-face teaching.*
>
> *Esra: Distance education is designed to compensate for face-to-face education thus it prevents students to take a dislike to school or lessons.*
>
> *Gorkem: … trying to teach remotely to students that we cannot meet face-to-face.*

Thus, it reflected that the meaning participants ascribe to distance education was transferring of face-to-face learning to the online environment. Here, considering that the emergency remote teaching process is the first online learning experience of the participants, it can be thought that this situation affects the meaning they ascribe to distance education. On the other hand, all the participants pointed to the importance of distance education in today's digital age. They agree that distance education is gaining increasing importance in every aspect of life.

Following their views regarding what the concept of distance education means, participants' views about the advantages and/or disadvantages of online learning compared to face-to-face learning were questioned. In this context, all of the participants evaluated the advantages and/or disadvantages of distance education depending on the emergency remote teaching process which they experienced during the COVID-19 pandemic. They thought that the most obvious advantage of emergency remote teaching is the flexibility of time and space for learners. In addition, Emir pointed out the advantage of diversity of digital content. He stated that *"Distance education provides access to different digital contents, multiple media, visual and audio"* and reflected his knowledge on this subject. Again, Cansu, who has a student from the disadvantaged student group in her class, stated the advantage of providing important facilities for disadvantaged students. She said that *"My disabled student participated in online lessons very comfortably during COVID-19 outbreak and this was a great advantage for her."* Another participant, Ozge, expressed the advantage of supporting learners' academic performance increase. She said that *"Introverted students can make incredible progress in distance education process, I have observed it in my own online lessons"*. On the other hand, half of the participants (Ugur, Cansu, Ali, Gorkem and Su), mainly working in low socio-economic environments, considered lack of technical resources to hamper in education, and nearly half of the participants (six out of 10 participants) considered weakness of interaction between teacher and students in online learning environments as a significant disadvantage for distance education. Some sample views are presented below.

> *Gorkem: There are students who don't have the technology required for distance education, there are students who don't have internet. That's why not being able to reach every student is a major disadvantage.*
>
> *Cansu: Interaction with students is very important. Not being able to see the gestures and movements of the students during the distance education process and not being able to get feedback creates hesitations about whether the subject is understood or not. I think it is a big disadvantage.*

## Using Digital Technologies in Distance Education

In order to examine participants' views about the use of digital technologies in distance education, firstly, participants' views about the use of the internet were questioned. Here, it was seen that regardless of the socio-economic environment in which they work, most of the participants (eight out of 10 participants) stated that they use internet for the purpose of accessing written contents such as z books, mathematical problems and learning outcomes tests in the EBA platform. For instance, one of these participants stated that *"I access z books via the internet. Because, I usually prefer using books with video solutions"* (Esra). Another participant stated that *"I generally use internet to find different types of problems and to see the experiences of other teachers"* (Emre). Thus, it clearly reflected the participants' use of internet to access different types of written content. On the other hand, regarding the use of the internet in mathematics teaching, four participants (Ugur, Ali, Cansu and Mert) mentioned the use of various educational software in order to generate technology-supported lessons. For instance, one of these participants stated that *"We know that some mathematics subjects can be taught more easily through educational software"* (Ali). Another participant stated that *"I think that the use of internet, in a sense, educational software is very useful especially in subjects such as geometry and three-dimensional objects"* (Ugur).

In order to examine participants' views about the use of digital technologies in distance education, secondly, participants' views about the use of educational social media were questioned. It was seen that, all of the participants stated that they did not know any educational social media platforms (e.g. Edmodo, Edcanvas) and did not use any of them. Thus, they interpreted the use of educational social media in distance education as the educational use of social media platforms (such as Facebook, WhatsApp, YouTube). In this context, two of the participants (Ugur and Ali) thought that social networks does not support the development of mathematical knowledge and skills. On the other hand, it was seen that rest of the participants' use of social networks was limited to WhatsApp platform. They stated that they use this platform to solve mathematical problems that students have difficulty and to share various documents with students. Some sample views are presented below.

> *Cansu: I think social networks are useful. For instance, I send math videos to my students via social network. Again, I can send voice recordings to answer students' questions.*
>
> *Ozge:… For instance, students take a photo of a problem and send it on WhatsApp, and I solve it and send back. When (s)he doesn't understand the solution, I press the voice recording button and explain it. An incredibly useful application.*

In order to examine participants' views about the use of digital technologies in distance education, lastly, participants' views about the use of video in distance education were questioned. Here, it was seen that all of the participants regarded the use of educational videos as video lectures that can be accessed from various platforms (such as Education Information Network, YouTube). In this context, the participants thought that video lectures are digital contents that help students to understand the mathematical subjects and/or mathematical problems that they have difficulty to understand. For instance, Esra stated that *"Students can watch the video lectures of any teacher on math subjects they do not understand"*. Similarly, Emre stated that *"Students can watch the video lectures to make up their shortages in math subjects or problems"* and these expressions reflected the participants' points of views about the use of videos in distance education.

## EBA Online Lessons

In order to examine participants' evaluations about their emergency remote teaching experiences, the question of "How do you conduct your EBA online lessons?" was directed first. In this context, the participants pointed to their effort to transfer the face-to-face learning environment to online environment in EBA online lessons. Below, the explanations of Cansu and Esra about how they conducted their online lessons are presented as example.

> *Canan: … I screen shared the mathematics textbook. I conducted my online lessons based on the textbook and solved the problems in the textbook. I have also download some documents about mathematical problems and shared my screen. I wanted students to solve the problems. Then, the students who solved the problems explained how they solved it.*
>
> *Esra: I have accessed the z books of several publications. I shared my screen like using a smart board at school. I explained the subject first and then we solved problems. When you press the solution button in z books, the solution of the problem appears on the screen, so I shared the solution.*

Additionally, the participants stated that they could not adopt any online learning teaching strategies. As a matter of fact, expressions such as *"I try to conduct my online lessons similar to the lessons I taught in the classroom (Emre)"* and *"Online lessons should have been different from face-to-face education, but I could not do something different (Ugur)"* clearly reflect this situation.

On the other hand, online lesson materials used by the participants were mainly mathematics textbooks, lecture slides, video recordings (EBA videos), z books and screen sharing technology. However, one of the participants, Ozge stated that she used the Kahoot application as a Web 2.0 tool, while another participant Gorkem stated that she prepared lecture videos on YouTube. Some sample views are presented below.

> *Emir: I share the videos and content of EBA. I am trying to solve learning objectives tests/problems in EBA platform. I can say that I chose using this platform because it was easy.*
>
> *Cansu: I always get my students watch EBA videos in face-to-face education, and I think EBA videos are useful in the distance education process, too.*
>
> *Ozge: I wondered how to make online lessons more enjoyable and how the students participate in online lessons. As an alternative, I used the Kahoot app.*

Following questioning how the participants conducted their EBA online lessons, their evaluations regarding the provision of interaction (interactions between learner-teacher and learner-learner) were questioned. Here, it was observed that the participants tried to increase learner-teacher interactions in online lessons by providing instructional communication or instructional support. That is, the participants stated that they asked questions about the mathematics subject or encouraged students to ask questions about the subject in order to interact with the students. For instance, the following expressions reflected the participants' efforts to increase learner-teacher interactions, *"I generally provide interaction by opening the microphone of the student so that s(he) can answer my question"* (Ugur) and *"I want students to ask questions, that is, to talk about things they do not understand"* (Ali).

On the other hand, almost all of the participants (nine out of 10 participants) believed that they could not provide learner-learner interactions in their online lessons. These participants stated that in the emergency remote teaching period, students' microphones and cameras were turned off in online lessons, and this limitation restricted the interaction of students with each other. Accordingly, the participants stated that in their online lessons students were quite passive and that they mainly used the method of direct instruction. For instance, Emre stated that *"In truth, the students did not interact much with each other, they just listened to me"*. Similarly Esra stated that *"I did not allow the students to interact with each other. They did not share any knowledge or make screen sharing"*. On the other hand, the following expression of Ozge reflected her effort to provide learner-learner interactions, *"I asked questions such as What do you think?, What do you think about your friend's thinking?, Do you agree or disagree with your friend?"*.

## Shortcomings of EBA Online Lessons

Following their views about EBA online lessons, the participants were asked to make a self-assessment of their effectiveness in conducting the EBA online lessons. In this context, all of the participants stated that in emergency remote teaching period, they worked to support students' understanding of mathematics subjects, as such in the face-to-face learning. However they found themselves partially sufficient to conduct online lessons effectively. In this context, all the participants pointed to their lack of knowledge and skill to use online learning. Therefore, the participants emphasized their need for professional development about use of digital technology and designing online lesson materials for distance mathematics education. Some sample views are presented below.

> *Su: I feel very lacking in how to teach mathematics more effectively in distance education.*
>
> *Cansu: I have to make progress in using the internet effectively, designing digital mathematical content, designing online lessons and making instructional videos.*
>
> *Ugur: How can I design a course material that will make students more active? It is important that I should make progress in this regard.*

On the other hand, the participants, especially working in low socio-economic environment, emphasized students' lack of access to a computer/laptop or not having internet connection. For instance, Gorkem stated that "*I did my best, but I think it wasn't very effective. Most of the students could not participate in the online lessons due to lack of access to a computer. On the other hand, I don't know to what extent did the students participate in and follow the lesson*". Besides, nearly half of the participants (six out of 10 participants) emphasized lack of interactions between learner-teacher and learner-learner in online lessons. They drew attention to the negative effects of lack of interaction on giving feedback to students and on conducting online mathematics lessons effectively. For instance, Cansu stated that "*I don't think I am very effective in EBA online lessons. Because interaction is really important in math classes. I think that the inability to interact with the students significantly affected the effectiveness of the process*".

### Expectations

When their expectations regarding professional development about distance education were questioned, all of the participants thought that the emergency remote teaching period was an introduction to the widespread use of distance education. Accordingly, they emphasized that professional development in distance education has become a fundamental requirement. Thus, they expressed their expectations of in-service trainings which will be organized by the Ministry of National Education. In this context, depending on their lack of knowledge and skill to use online learning, participants expressed their expectations of in-service trainings about use of digital technologies and online lesson materials. Here, it was also seen that the participants, who emphasize lack of interactions between learner-teacher and learner-learner in online lessons, agreed that mathematics can be thought more effectively in face-to-face learning environments. Accordingly, these participants expressed their need for online learning environments that make students active participants of their learning process. Some sample views are presented below.

> *Emre: We need an online learning environment and e-learning contents that will make students more active.*
>
> *Cansu: I would like to design digital mathematics contents, design lectures and make math videos by using digital technologies.*
>
> *Ali: Trainings about how to plan interactive online lessons to ensure student participation can be organized.*
>
> *Ugur: I think that a training about how to design or implement online lesson materials that will motivate students and enable them to participate in the lesson will contribute to my professional development.*

## DISCUSSION AND CONCLUSION

Considering the emergency remote teaching period that was rapidly implemented in Turkey and all around the world during the COVID-19 outbreak and the role of teachers in carrying out this process effectively, in this study it was aimed to examine the evaluations of middle school mathematics teachers' emergency remote teaching experiences. The participants of this study was ten middle school mathematics teachers who was working in schools located in different socio-economic environments. As a result of the semi-structured interviews, it was seen that the meaning participating mathematics teachers ascribe to the concept of distance education was transferring of traditional classroom/face-to-face learning environment to the online environment. Besides, the participating mathematics teachers' understanding of using digital technologies in distance education was limited to access different types of written content via the internet or using social media platforms (e.g. WhatsApp and YouTube) for educational purposes or using video lectures that can be accessed from platforms such as Education Information Network, YouTube. As it is known, "distance" expression in the concept of distance education emphasizes physical, interactional and psychological distance and the expression 'remote' in the concept of emergency remote teaching emphasizes just physical distance (Bozkurt, 2020). Therefore, it can be said that participating mathematics teachers have a lack of knowledge about the concept of distance education. Here, it may be suggested to provide teachers with education about what distance education is and in what cases and how it should be applied.

Another result of the study was that regardless of the socio-economic environment in which they work, the participating mathematics teachers carried out emergency remote teaching period in ways that they could transfer the face-to-face learning environment to online environment. The educational activities of the participating mathematics teachers were mainly screen sharing mathematics textbooks or lecture slides, using z books, getting students to watch EBA videos or using video lectures. Thus, it can be said that participating mathematics teachers tried to replicate their face-to-face teaching strategies in online lessons and that their current understanding of the concept of distance education has influenced the way they conduct their online lessons. Considering that, emergency remote teaching differs from conventional distance education: being suddenly, unreadily and forcefully implemented (Hodges et.al., 2020), it may be usual that participating mathematics teachers made an effort to transfer their face-to-face lessons to the online environment during the pandemic period. However, it has been understood that in order for the distance education systems to be applied in situations such as the COVID-19 pandemic, teachers' knowledge and skill to use online learning should be improved. As a matter of fact, it was observed that participating mathematics teachers felt themselves partially sufficient to achieve the educational objectives by carrying out the emergency remote teaching process effectively and efficiently. They pointed to their lack of knowledge and skills to use online learning. Mailizar, Almanthari, Maulina and Bruce (2020) revealed a similar result that the top e-learning barrier regarding teachers as lack of knowledge and skills to use e-learning and their lack of confidence. Similarly, Trust and Whalen (2020) revealed that the biggest challenges teacher face during emergency remote teaching process was lack of knowledge about online/ remote teaching strategies and tools.

Regarding their evaluations about shortcomings of online lessons, participating teachers also pointed to lack of interactions between learner-teacher and learner-learner in online lessons. These results are consistent with earlier research (e.g. Tumen-Akyildiz, 2020; Hebebci, Bertiz & Alan, 2020; Karakaya, Arik, Cimen & Yilmaz, 2020). For instance, Hebebci, Bertiz and Alan (2020) revealed that the most important problem that teachers draw attention regarding distance education practices during COVID-19 pandemic is the lack of interaction. At this point it was also remarkable that because of lack of interactions between learner-teacher and learner-learner in online lessons, participating mathematics teachers used the method of direct instruction. Accordingly, they emphasized the importance of online learning environments that make students active participants of their mathematics learning process. Kocoglu and Tekdal (2020) also revealed a similar result in the study in which they analyze remote teaching activities. In this study it was observed that teachers used teacher-centered instruction method during remote teaching process. As is known, the online learning process should be designed in a way that students are more active, learner-centered and focused on supporting the knowledge and skills needed in the digital age (Bates, 2016). In other words, quality teaching designs in which learning objectives are clearly defined, educational content is carefully structured and innovative teaching methods gain importance. This requires teachers to be equipped with digital and pedagogical skills to teach remotely or online learning (LaBonte, 2020; UNICEF, 2020). In this regard, supporting the professional development of mathematics teachers about online learning becomes an issue that should be emphasized. As a consequence, it can be suggested to develop teacher training programs about how to design qulity online teaching and learning with technology. Thereby, teachers should be provided with the opportunity to develop knowledge and skills so that they are prepared to teach with technology in different formats or situations including online, remote or blended settings.

Finally, in this research it was seen that participating mathematics teachers, especially working in low socio-economic environments, mentioned lack of students' technical resources as a significant shortcoming of emergency remote teaching process. This result is consistent with earlier research results as one of the top e-learning barrier regarding students as lack of access to devices and internet connection for e-learning purposes (e.g. Albo et.al. 2020; Mailizar, Almanthari, Maulina & Bruce, 2020; Trust & Whalen 2020). Based on this result, it can be suggested to investigate challenges that mathematics teachers with students in low-income communities face during emergency remote teaching period. For instance, studies can be conducted to investigate mathematics teachers' use of technology and if there is a limitation in their use of technology due to access issues. In addition, similar studies can be conducted with students to examine their evaluations of online mathematics teaching.

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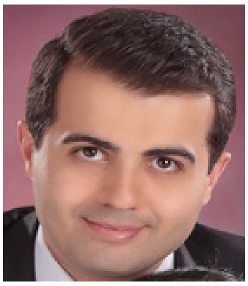

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## REFERENCES

Albo L., Beardsley M., Martinez-Moreno J., Santos P., & Hernandez-Leo, D. (2020). Emergency Remote Teaching: Capturing Teacher Experiences in Spain with SELFIE. In: Alario-Hoyos C., Rodriguez-Triana M., Scheffel M., Arnedillo-Sanchez I., Dennerlein S. (eds) Addressing Global Challenges and Quality Education. EC-TEL 2020. Lecture Notes in Computer Science, vol 12315. Springer, Cham.

Anderson, T. (2003). Modes of interaction in distance education: Recent developments and research questions. In M. Moore (Ed.), *Handbook of Distance Education*, 129-144. Mahwah, NJ.: Erlbaum.

Angoletto, R., & Queiroz, V. C. (2020). COVID-19 and the challenges in education. *The Centro de Estudos Sociedade e Tecnologia (CEST), 5*(2).

Bates A. W. (2014). *Teaching in a digital age: Guidelines for designing teaching and learning.* Vancouver BC: Tony Bates Associates Ltd.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report, 13*(4), 544-559.

Bogdan, R., & Biklen, S. (2007). *Qualitative research for education* (5th ed.). Boston: Allyn & Bacon.

Bozkurt, A. (2020). Koronavirus (Covid-19) pandemi sureci ve pandemi sonrasi dunyada egitime yonelik degerlendirmeler: Yeni normal ve yeni egitim paradigmasi. *AUAd, 6*(3), 112-142.

Bozkurt, A., & Sharma, R. C. (2020). Emergency remote teaching in a time of global crisis due to CoronaVirus pandemic. *Asian Journal of Distance Education, 15*(1), i-vi.

Bozkurt, A., Jung, I., Xiao, J., Vladimirschi, V., Schuwer, R., Egorov, G., ... Paskevicius, M. (2020). A global outlook to the interruption of education due to COVID-19 Pandemic: Navigating in a time of uncertainty and crisis. *Asian Journal of Distance Education, 15*(1), 1-126.

Burke, J., & Dempsey, M. (2020). COVID-19 Practice in primary schools in Ireland report. National University of Ireland Maynooth, Ireland. https://www.into.ie/app/uploads/2020/04/COVID-19-Practice-in-Primary-Schools-Report- 1.pdf.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed methods approaches* (4th ed.). London: Sage Publications Ltd.

Egitim Bilisim Agi (EBA). (October, 2020). *EBA'dan Canli Sinif*. Retrieved October 20, 2020 from http://eba.gov.tr.

Hebebci, M. T., Bertiz, Y., & Alan, S. (2020). Investigation of views of students and teachers on distance education practices during the Coronavirus (COVID-19) Pandemic. *International Journal of Technology in Education and Science (IJTES), 4*(4), 267-282.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review*. https://er.educause.edu/articles/2020/3/thedifference-between-emergency-remote- teaching-and-online-learning.

Iwai, Y. (2020). Online Learning during the COVID-19 Pandemic: What do we gain and what do we lose when classrooms go virtual?, *Scientific American.*

Karakaya, F., Arik, S., Cimen, O., & Yilmaz, M. (2020). Investigation of the views of biology teachers on distance education during the COVID-19 pandemic. *Journal of Education in Science, Environment and Health (JESEH), 6*(4), 246-258.

Keskin, M., & Ozer-Kaya, D. (2020). Evaluation of students' feedbacks on web-based distance education in the COVID-19 process. *Izmir Katip Celebi Universitesi Saglik Bilimleri Fakultesi Dergisi, 5*(2), 59-67.

Kocoglu, E., & Tekdal, D. (2020). Analysis of education activities conducted during COVID-19 pandemic. *Educational Research and Reviews, 15*(9), 536-543.

Knowles, M. S. (1975). *Self-directed learning: A guide for learners and teachers.* New York: Association Press.

LaBonte, R. (2020). Emergency Remote Teaching: Resources, Tools, and Ideas. Retrieved October 20, 2020 from https://canelearn.net/emergency-remote-teaching/

Mailizar, Almanthari, A., Maulina, S., & Bruce, S. (2020). Secondary school mathematics teachers' views on e-learning implementation barriers during the Covid-19 pandemic: The case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education, 16*(7).

Miles, M., & Huberman, A. (1994). *Qualitative data analysis* (2nd ed). Thousand Oaks, CA: Sage.

Moore, M. G. (1989). Three types of interaction. *American Journal of Distance Education, 3*(2), 1-6.

Moore, M. G. (1993). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education*, 22-38. New York: Routledge.

Mulenga, E. M., & Marbán, J. M. (2020). Is COVID-19 the gateway for digital learning in mathematics education? *Contemporary Educational Technology, 12*(2).

Rovai, A. P., & Downey, J. R. (2010). Why some distance education programs fail while others succeed in a global environment. *The Internet and Higher Education, 13*(3), 141-147.

Shisley, S. (2020). Emergency remote learning compared to online learning. *Learning Solutions*. https://learningsolutionsmag.com/articles/emergency-remote-learning-compared-to-online-learning

Talidong, K. J. (2020). Implementation of emergency remote teaching (ERT) among Philippine teachers in Xi'an, China. *Asian Journal of Distance Education, 15*(1), 196-201.

Trust, T., & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the Covid-19 pandemic. *Journal of Technology and Teacher Education, 28*(2), 189-199.

Tumen-Akyildiz, S. (2020). College students' views on the pandemic distance education: A focus group discussion. *International Journal of Technology in Education and Science (IJTES), 4*(4), 322-334.

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2020). School closures caused by Coronavirus (Covid-19). UNESCO. https://en.unesco.org/covid19/educationresponse

United Nations International Children's Emergency Fund (UNICEF). (2020). Teachers: Leading in crisis, reimagining the future. https://www.unicef.org/press-releases/teachers-leading-crisis-reimagining-future

Whittle, C., Tiwari, S., Yan, S., & Williams, J. (2020). Emergency remote teaching environment: A conceptual framework for responsive online teaching in crises. *Information and Learning Sciences, 121*(5/6), 311-319.

Yildirim, K. (2020). Lessons from an exceptional distance education experience. *Alanyazin, 1*(1), 7-15.

# INVESTIGATION OF THE ATTITUDES DISTANCE EDUCATION OF THE FACULTY OF SPORT SCIENCE STUDENTS IN THE COVID-19 PERIOD

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## ABSTRACT

In this study, it was aimed to examine the attitudes of the Faculty of Sport Sciences Students education in the period of COVID-19 according to gender, class, regular internet access status, courses attendance status, the device in which the courses were followed, the evnironment to attend courses and viewing distance education useful variables. In the research general survey model was used. Participants consisted of 98 volunteer students who were selected according to the random sampling method studying in the Department of Exercise and Sport Education for Disabled People at Malatya Inonu University Faculty of Sport Sciences. In the research The Attitude Scale for E-learning was used. The data analysis of the research was carried out in SPSS 22.0 statistics package program for Windows. Normality distribution was done by the Kolmogorov-Smirnov normality test. Differences between groups were determined using independent sample t-test (Independent Samples T-Test) and one-way analysis of variance (One-way ANOVA) and Post-Hoc LSD tests. Significance was accepted as ($p < 0.05$). As a result of the research, it has been observed that the attitudes of the students of the Faculty of Sport Sciences towards distance education have significant differences according to gender, regular internet access status, the environment of attending classes, discomfort while listening to courses and finding distance education useful. The results of the research revealed that the students found the distance education applied in COVID-19 period beneficial.

**Keywords:** COVID-19, pandemic, remote education, students, faculty of sports sciences.

## INTRODUCTION

The coronavirus is an epidemic that emerged in December 2019 in Wuhan, China, with the an increase in chronic pneumonia cases. The symptoms are seen afterward and the results of laboratory tests were defined as the new coronavirus 2019 (COVID-19) (Huang et al., 2020). Considered an epidemic by the World Health Organization (WHO), COVID-19 has significantly affected daily life around the world. Practices and restrictions brought in order to slowdown and control the spread of the epidemic have rapidly changed people's daily lifestyles in many areas such as nutrition, movement, consumption, habits, education and training (Korkut Gencalp, 2020). The COVID-19 pandemic has been effective in many areas. One of the are as where the epidemic is effective is education.

Due to the COVID-19 outbreak, formal education has been suspended in 192 countries. Around 1.2 billion students and 63 million teachers worldwide have been directly affected by the epidemic (Duşkun, 2020; UNESCO, 2020). The suspension of formal education due to the epidemic has brought distance education to the agenda all over the world. Distance education has been put into use as the easiest solution to ensure sustainability in education during the epidemic period. With the developing technology, the widespread use of systems such as MOOC shows that the distance education model is already accepted as a usable education model. At this point, agreements have been made between large-scale distance education platforms such as Coursera, Udemy, Udacity, Edex and universities, and such distance education applications have become widespread around the world (Telli &Altun, 2020). To use such systems previously used more functionally during the epidemic period, countries have quickly completed their preparations and started distance education.

During the epidemic period, educational institutions in most countries carry out their activities through distance education (ETF, 2020; Reimers, 2020) For example, the Chinese higher education system has switched to a comprehensive distance education application from kindergarten students to doctoral students in distance education (Lau, Yang & Dasgupta, 2020). More than 100 universities in the USA, including universities such as Ohio State, Harvard, Duke, Columbia, Tufts, have switched from formal education to distance education (Pfleger, 2020). In Italy, one of the countries where COVID-19 is most effective, March 4 Education in schools was suspended temporarily in 2020 (Togoh, 2020). Also, 2000 teachers were included in the distance education seminar with the distance education portal created (Kotasova & Isaac, 2020; Benu, 2020). Similar is the case in Turkey.

Faced COVID-19 pandemic now than in European countries, Turkey is among the countries at the earliest measures against the epidemic. Quickly, methods of combating the virus in the world were evaluated. As a result of the evaluations made, the schools affiliated with the Ministry of National Education were closed on March 11, 2020, and distance education was started after a one-week preparation period. In higher education, education was suspended for 3 weeks first, and then it was decided to continue the 2020 spring semester with distance education (CoHE, 2020). Accordingly, the decisions and measures taken regarding the epidemic in higher education institutions in other countries were examined and plans were made considering the existing capacity of CoHE. In line with the planning made, universities with suitable infrastructure started distance education on March 23, 2020. Within the scope of distance education, theoretical courses will be given first, and it has been decided that practical courses will be given at the most appropriate time in line with the calendar to be determined by the universities (Telli & Altun, 2020).

One of the important changes made in the field of higher education recently is the use of technology to improve learning. In addition to traditional campus-based courses, distance education programs supported by digital technology infrastructure are the biggest indicator of this change. (Daniels &Thistlethwaite, 2016). Many universities now offer distance education courses and programs to meet the various educational needs of students and to keep up with developing technology (Fidalgo, et al., 2020). This type of training is handled in two ways, synchronous and a synchronous. In synchronous courses, students and teachers can communicate online in a virtual classroom environment. In synchronous courses, the parties can communicate their requests to each other on the subjects related to the course as in the classroom environment, and they can ask questions, answer and exchange information with each other. In a synchronous courses, the student can access the course via the internet from anywhere at any time without the obligation to communicate online, video, audio recording etc. related to the pre-loaded course. Can access materials (Sercemeli & Kurnaz, 2020). In the distance education system, students have to continue their education on their own, causing them to experience problems such as personal and social loneliness, inability to communicate and interact adequately (Ekici, 2003). There should be an appropriate instructor who can provide accurate and effective communication, effective and efficient information transfer (Sercemeli & Kurnaz, 2020). It is among the questions that are wondering how the rapid transition to distance education due to COVID-19 has an impact on students caught unprepared for this education method. For this reason, it is seen that the effects of distance education applied in the epidemic period worldwide on students are investigated.

In the literature, researches conducted by Bao (2020), Abbasi et al., (2020), Anca and Cosmina (2020), Telli and Altun (2020), Sercemeli and Kurnaz (2020) on the effects of distance education during the COVID-19 period have been found. As in all the world there is a sudden transition to distance education students in Turkey has led to the availability and experiencing various problems and challenges on issues such as adaptation. In universities where mostly formal education is given, what kind of effect the sudden transition to distance education has on the adaptation and adaptation of students is among the subjects that are curious and need to be researched. Also, it is useful to know whether the infrastructure used for distance education is sufficient for the new situation and how possible problems that may arise in issues such as the availability of internet access affect students.

In distance education, students' prejudices and attitudes towards this education type may differ. It is thought that it is scientifically important to learn the attitudes of students towards distance education, since students who have received formal education and who have adopted this form of education switch to distance education suddenly regardless of their technology experience. It is especially useful to learn about the attitudes of students who take applied courses in their field in the Faculty of Sports Sciences towards distance education during the epidemic period. Therefore, the main purpose of this study is to learn the attitudes of the undergraduate students of the Faculty of Sport Sciences Department of Exercise and Sports Education for the Disabled towards the distance education applied during the COVID-19 period and to make suggestions by making evaluations in this direction. During the COVID-19 epidemic, it is thought that it is important to learn the opinions of the students who receive compulsory distance education about the distance education system and distance education courses and to contribute to the literature. Thus, it is thought that conducting such researches will be beneficial to be more prepared and experienced to continue education in the face of possible sudden situations.

Accordingly, the sub-problems of the research are as follows:

1. Does the perception of the students of the Faculty of Sports Sciences towards distance education during the COVID-19 period differ by gender?
2. Does the perception of the students of the Faculty of Sports Sciences towards distance education during the COVID-19 period differ according to the class status?
3. Does the perception of the students of the Faculty of Sports Sciences towards distance education during the COVID-19 period differ according to internet Access status?
4. Do the perceptions of the students of the Faculty of Sports Sciences towards distance education during the COVID-19 period differ according to their participation in distance education courses?
5. Do the perceptions of the students of the Faculty of Sport Sciences towards distance education during the COVID-19 period differ according to the device on which the distance education course is listened?
6. Do the perceptions of the students of the Faculty of Sports Sciences towards distance education during the COVID-19 period differ according to the environment where the distance education course is listened?
7. Does the perception of the students of the Faculty of Sports Sciences towards distance education during the COVID-19 period differ according to their status of seeing distance education as beneficial?

## METHODS

In this section, the research model, participants, data collection and analysis are included.

### Research Model

In this research, the general survey model was used following the descriptive research method, one of the quantitative research methods. In this research, "Faculty of Sports Sciences Students "Attitudes towards Distance Education in the COVID-19 Period" in terms of various variables general survey model was used due to the attempt to examine. A survey model is a research approach that aims to describe a past or present situation as it exists (Karasar, 2018).

## Participants

In this research random sample method was used. In the random sampling method the sample's power to represent the universe is very high. By means of this method, valid for the universe creation of highly representative samples for which generalizations can be made is targeted. In this sampling method, all units in the universe have an equal and independent probability of sampling. In other words, the probability of being selected for all individuals is the same and an individual's choice affects the choice of other individuals (Karasar, 2018). For these reasons, in this research simple random sampling model was preferred. The universe of the research consists of the Students of the Faculty of Sports Sciences. The sample of the study is the students of Malatya Inonu University, Faculty of Sport Sciences, Department of Exercise and Sports Education for the Disabled. Participants consist of a total of 98 people, 59 male and 41 female, who voluntarily participated in the research. Participants' ages are between 18 (years) and 29 (years).

## Data Collection and Analysis

Before the data collection process, the permission required for the implementation of the scale was obtained from Osmaniye Korkut Ata University Scientific Research and Publication Ethics Board dated 27/07/2020-20391. The scale was administered to students through the electronic questionnaire application Wattsapp communication and information sharing groups, via Google Forms due to the epidemic. Participating students were given detailed information about the research topic through the communication and information sharing group. The survey application was completed by 98 volunteer students. In the research SPSS 22.0 statistics program for Windows® was used for data analysis. The distribution of normality was done with the Kolmogorov-Smirnov normality test. Differences between groups were determined using the Independent Samples T-Test, one-way analysis of variance (One-way ANOVA) and Post-Hoc LSD tests. LSD test is a post-hoc statistic whose choice is considered undesirable if the number of groups to determine the difference (k means) is more than 3 (Efe et al., 2000; Kayri, 2009). Mathematically, it is highly vulnerable to type I error. Because, although Type I error level (α) is chosen as 5%, the amount of error per group increases as the number of groups increases. Again, according to the example given by Efe et al. (2000) for LSD, while αgroup = 0.05, the amount of error per group for the mean of 10 groups increases to αgroup = 0.3693 [= (1-(1-α) k-1) = (1- (1-0.05) 10-1) = 0.3693]. That is, as the number of groups increases, the amount of α error also increases. Therefore, LSD multiple comparison statistics should not be used if the number of groups compared is high (Kayri, 2009). In research significance was accepted as $p < 0.05$.

**Table 1.** Normality Distributions of the Score Values of the Attitude Scale Towards E-Learning

| Parameter / Unit | Statistics | Sd. | p | Flatness | Distortion |
|---|---|---|---|---|---|
| Scale Total | ,768 | 98 | ,163 | ,401 | - ,687 |
| Ability to E-Learning | ,675 | 98 | ,141 | ,698 | - ,872 |
| Avoiding E-Learning | ,881 | 98 | ,154 | ,562 | - ,745 |

*p<0.05

In Table 1, it was determined that the scale total score of the Attitude Scale towards E-Learning obtained from the students of the Faculty of Sports Sciences and all sub-dimension scores of the scale have a normal distribution according to the results of Kolmogorov-Smirnov normality distribution test and kurtosis-skewness values ($p > 0.05$).

### The Scale

"Attitude Scale Towards E-Learning" was used in the study.

### *Attitude Scale Towards E-Learning*

The scale developed by Wilkinson et al., (2010) was adapted into Turkish by Haznedar (2012). The scale has a five-point Likert type structure and consists of 20 items and two sub-dimensions ($\alpha$ = .93). The first sub-dimension was defined as "disposition to e-learning" and the second sub-dimension as "avoiding e-learning". The items "E-learning interests me" for the first sub-dimension and "E-learning is unnecessary" for the second sub-dimension can be given as examples. In the analyzes made during the adaptation to Turkish, the Cronbach Alpha coefficient value for the reliability estimation of the scale was determined as 0.93 for the EOT sub-dimension and 0.84 for the IPC sub-dimension. The total (for 20 items) Cronbach Alpha coefficient value of the EOT scale was found to be 0.93. Scale reliability coefficients obtained from this study were found as E-Learning (Scale Total), 838 E-Learning Tendency (Sub-Dimension):, 847 Avoiding E-Learning (Sub-Dimension), .83.

### *Exploratory Factor Analysis (EFA)*

For the construct validity of the E-Learning Attitude Scale form, EFA was first performed. To perform this analysis, the KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) test, which tests the adequacy of the sample, was examined first. KMO value was found to be .81. According to Buyukozturk (2002), since this value is greater than .70, it has been concluded that factor analysis can be made on these data. Secondly, by looking at the Bartlett Sphericity test (2 = 4165.70, p = .001), it was determined that the data obtained were suitable for factor analysis as they differed significantly (Buyukozturk, 2002). In the factor analysis, varimax axis rotation was performed, with the eigenvalues of 20 items being 1, primarily for principal component analysis. After Varimax rotation, 20 items were gathered under two factors with an eigenvalue greater than 1. In the scale showing the two factor structure, the first of the factors explained 37,806% of the total variance, the second being 20,101%, a total of 57,907%. As a result of the validity studies, it was found that the scale has a two-factor structure. As a result of factor analysis with an eigenvalue of 1, the number of factors in the scale is two. In this respect, a two-factor structure related to the scale was preferred. Detailed results of the exploratory factor analysis are given in Table 2, Table 3 and Table 4.

**Table 2.** KMO and Bartlett Test Results

| **Kaiser-Meyer-Olkin Sampling Adequacy** | | 0,810 |
|---|---|---|
| **Bartlett Test of Sphericity** | Approximate Chi-square | 4165.70 |
| | SD | 98 |
| | P | ,001 |

**Table 3.** Exploratory Factor Analysis Variance Explanation Ratio Results

| **Matter** | **Initial Eigenvalues** | | | **Rotated Factor Loads** | | |
|---|---|---|---|---|---|---|
| | **Total** | **Variance %** | **Cumulative %** | **Total** | **Variance %** | **Cumulative %** |
| **M1** | 8,588 | 37,806 | 46,896 | 6,524 | 32,456 | 22,839 |
| **M2** | 5,778 | 20,101 | 57,907 | 4,875 | 19,889 | 57,907 |
| **M3** | ,987 | 8,735 | 58,992 | | | |
| **M4** | ,947 | 7,853 | 65,945 | | | |
| **M5** | ,862 | 6,325 | 70,869 | | | |
| **M6** | ,787 | 5,112 | 71,874 | | | |
| **M7** | ,730 | 4,894 | 73,985 | | | |

| | | | |
|---|---|---|---|
| **M8** | ,711 | 4,393 | 75,353 |
| **M9** | ,668 | 4,051 | 76,786 |
| **M10** | ,566 | 3,472 | 78,575 |
| **M11** | ,534 | 3,276 | 81,801 |
| **M12** | ,500 | 3,113 | 82,525 |
| **M13** | ,487 | 3,064 | 84,895 |
| **M14** | ,455 | 2,779 | 87,693 |
| **M15** | ,425 | 2,582 | 90,239 |
| **M16** | ,384 | 2,472 | 92,997 |
| **M17** | ,354 | 2,139 | 94,856 |
| **M18** | ,319 | 1,920 | 96,786 |
| **M19** | ,290 | 1,651 | 98,577 |
| **M20** | ,246 | 1,573 | 100,000 |

**Table 4.** Rotated Factor Analysis Results

| Factor Name | Matter | Factor 1 | Factor 2 |
|---|---|---|---|
| **Ability to E-Learning** | M6 | **,811** | ,341 |
| | M12 | **,795** | ,351 |
| | M17 | **,781** | ,251 |
| | M15 | **,765** | ,114 |
| | M5 | **,748** | ,068 |
| | M17 | **,722** | ,221 |
| | M16 | **,715** | ,147 |
| | M9 | **,686** | ,201 |
| | M20 | **,674** | ,054 |
| | M7 | **,657** | ,074 |
| **Avoiding E-Learning** | M8 | **,244** | **,687** |
| | M11 | **,201** | **,674** |
| | M18 | **,157** | **,666** |
| | M4 | **,149** | **,652** |
| | M1 | **,068** | **,644** |
| | M14 | **,100** | **,623** |
| | M19 | **,164** | **,614** |
| | M2 | **,177** | **,592** |
| | M3 | **,080** | **,583** |
| | M10 | **,099** | **,571** |

## FINDINGS

All findings of the research were given in tables in detail. The general attitude values of participating students to e-learning according to their gender during the epidemic period were given in Table (5).

**Table 5.** The General Attitude Values of the Students towards E-Learning According to Their Gender During the Epidemic Period

| Parameter | Group | n | $\bar{X}$ | Ss. | t | Sd. | P |
|---|---|---|---|---|---|---|---|
| Ability to E-Learning | Male | 59 | 22,6 | 4,2 | -4,778* | 98 | ,000* |
| | Female | 41 | 30,4 | 3,6 | | | |
| Avoiding E-Learning | Male | 59 | 32,6 | 4,4 | -4,665* | 98 | ,000* |
| | Female | 41 | 23,5 | 5,1 | | | |

*p<0.05

According to Table 5; In the epidemic period, a significant difference was found between the general attitudes of the students who participated in the study towards e-learning and their attitudes towards both e-learning and avoidance of e-learning (p <0.05). In these differences determined; It was determined that female students had higher values than male students in the e-learning disposition sub-dimension, and male students had higher values than female students in the e-learning avoidance sub-dimension (p <0.05). The general attitude values of the participating students according to their regular internet access during the epidemic period were given in table (6).

**Table 6.** The General Attitude Values of the Students According to their Regular Internet Access During the Epidemic Period

| Parameter | Group | n | $\bar{X}$ | Ss. | t | Sd. | p |
|---|---|---|---|---|---|---|---|
| Ability to E-Learning | Yes | 64 | 31,6 | 3,2 | 3,698* | 98 | ,001* |
| | No | 36 | 24,3 | 4,1 | | | |
| Avoiding E-Learning | Yes | 64 | 18,3 | 5,2 | 4,115* | 98 | ,000* |
| | No | 36 | 27,2 | 5,3 | | | |

*p<0.05

According to Table 6; A significant difference was found between the general attitudes towards e-learning according to their regular internet Access status during the epidemic period of the students participating in the study, and their attitudes towards both e-learning tendency and avoidance of e-learning (p <0.05). In these differences determined; In the e-learning disposition sub-dimension, it was determined that students with regular internet access had higher values than students who did not have regular internet access, and students who did not have regular internet access in the e-learning sub-dimension had higher values than students with regular internet access (p <0.05). The attitudes of participating students towards e-learning according to the environment in which they listened to distance learning courses during the epidemic period were given in Table (7).

**Table 7.** General Attitude Values Towards E-Learning According to The Environment in which Students Attend the Courses in E-Environment During the Epidemic Period.

| | No | Group | n | $\bar{X}$ | Ss. | p | F | Sd. | Post-Hoc (LSD) |
|---|---|---|---|---|---|---|---|---|---|
| Ability to E-Learning | 1 | In a family home environment | 33 | 22,6 | 3,1 | ,000* | 5,114* | 2 | 2>1*(p= ,000) 2>3*(p= ,000) 3>1*(p= ,000) |
| | 2 | Home alone | 39 | 30,4 | 3,0 | | | | |
| | 3 | others | 28 | 27,6 | 3,5 | | | | |
| Avoiding E-Learning | 1 | In a family home environment | 33 | 31,2 | 3,8 | ,000* | 6,004* | 2 | 1>2*(p= ,000) 1>3*(p= ,001) 3>2*(p= ,000) |
| | 2 | Home alone | 39 | 23,3 | 3,4 | | | | |
| | 3 | others | 28 | 26,4 | 3,3 | | | | |

*p<0.05

According to Table 7; A significant difference was determined from the general attitudes of the students participating in the study, according to their environment of participating in distance education courses during the epidemic period, from both the tendency to e-learning and their attitudes towards avoiding e-learning (p <0.05). In this difference determined; In the e-learning sub-dimension, students who participate in courses alone at home have higher values than those in the family environment and other living environments, and students in other living environments have higher values than students who attend courses in the family environment at home, and in the sub-dimension of avoiding e-learning, It was determined that the students who attended the courses in other living environments than the students who attended the courses and the students who attended the courses alone at home, the students in the other living environment have higher values than the students living alone at home (p <0.05). The general attitude values of participating students towards e-learning according to their disturbance while attending distance education courses during the epidemic period were given in table (8).

**Table 8.** The General Attitude Values of Students Towards E-Learning According to Their Disturbance While Attending Distance Education Courses During The Epidemic Period.

| Parameter | Group | n | $\bar{X}$ | Ss. | t | Sd. | p |
|---|---|---|---|---|---|---|---|
| Ability to E-Learning | Yes | 51 | 24,8 | 3,8 | 3,996* | 98 | ,000 |
| | No | 49 | 30,9 | 4,2 | | | |
| Avoiding E-Learning | Yes | 51 | 19,3 | 5,9 | 4,538* | 98 | ,000 |
| | No | 49 | 26,1 | 5,1 | | | |

*p<0.05

According to Table 8; A significant difference was found between the general attitudes towards e-learning and both e-learning tendency and avoidance attitudes towards e-learning according to the state of being disturbed while attending the distance education courses applied during the epidemic period of the students participating in the study (p <0.05). In these differences determined; In the e-learning sub-dimension, students who were not disturbed while participating in distance education courses had higher values than students who were disturbed while participating in distance education courses, and in the sub-dimension of e-learning avoidance, students who were disturbed while attending distance education courses had higher values than students who were not disturbed while participating in distance education courses. It was observed ($p < 0.05$). The general attitudes of participating students towards e-learning according to their status of finding distance learning useful during the epidemic period were given in Table (9).

**Table 9.** General Attitudes of Students Towards E-Learning According to the Situation of Finding Distance Education Useful During The Epidemic Period.

| | No | Group | n | $\bar{X}$ | Ss. | p | F | Sd. | Post-Hoc (LSD) |
|---|---|---|---|---|---|---|---|---|---|
| Ability to E-Learning | 1 | Yes | 39 | 34,8 | 5,2 | ,000 | 4,447* | 2 | 1>2*(p= ,000) 1>3*(p= ,000) |
| | 2 | No | 27 | 22,9 | 2,8 | | | | |
| | 3 | No comment | 34 | 25,5 | 4,1 | | | | |
| Avoiding E-Learning | 1 | Yes | 39 | 23,8 | 3,1 | ,000 | 4,635* | 2 | 2>1*(p= ,000) 2>3*(p= ,000) |
| | 2 | No | 27 | 33,6 | 5,2 | | | | |
| | 3 | No comment | 34 | 26,1 | 4,3 | | | | |

*$p<0.05$

According to Table 9; A significant difference was determined from the general attitudes towards e-learning, both from e-learning tendency and attitudes avoiding e-learning, according to the situation of the students participating in the study finding distance education useful during the epidemic period ($p < 0.05$). In this difference determined; In the e-learning sub-dimension, students who find distance education useful during the epidemic period have higher values than students who do not find distance education useful during the epidemic and have no idea about the benefits of education applied during the epidemic period, and in the e-learning avoidance sub-dimension, distance education applied during the epidemic period is beneficial. The students who did not find it were found to have higher values than the students who found distance education useful during the epidemic period and the students who had no idea about the faults of the education applied during the epidemic period ($p < 0.05$).

There was no significant difference between the attitudes of the Participating Students towards Distance Education Applied during the Epidemic Period and the variables of the class, the attendance status and the device that the courses were followed ($p > 0.05$).

## DISCUSSIONS AND CONCLUSION

In this study, the attitudes of the Faculty of Sports Sciences students towards distance education during the COVID-19 period were examined according to the variables of gender, class, internet Access status, participation in classes, the device on which the courses are followed, the environment of attending classes and seeing distance education as beneficial. As a result of the research, it was observed that there were significant differences in the attitudes of the students of the Faculty of Sport Sciences towards distance education variables according to the variables of gender, regular internet access, participation environment, being disturbed while listening to courses and finding distance education useful. In the study, it was observed that a substantial part of the students found distance education applied during the epidemic period beneficial.

These results can be interpreted as that students find distance education useful in terms of not disrupting education and experiencing any victimization during the epidemic period. Also, the limited number of studies on the attitudes of university students towards distance education during the COVID-19 period makes it difficult to evaluate these research results.

In the study, it was observed that students' attitudes towards distance education differ significantly in favor of female students according to gender. The conclusion of the present study may be interpreted as the fact that female students see education and school as an opportunity to prove themselves and their desire to be successful plays an active role in their high attitude towards distance education. Eğrican (2011) stated in studies on female students that women are more docile than men, they are more determined to be successful than men, that female students see being successful in education as a prerequisite for self-fulfillment, and this situation motivates them. Even if COVID-19 changes the way of education, it can be said that female students have a high attitude towards distance education in order not to disrupt their education and to maintain or increase the level of success. Also, the fact that females are more prone to docile, their internalization of school rules and their high motivation to learn online may be effective in the emergence of this result. Some studies have shown that female students have better online communication and have higher motivation to take online courses than male students. It was also observed that female students performed better in online courses and exams, continued their courses without interruption, and were more successful in organizing their own programs. It was also observed that female students were more consistent in achieving their goals and had higher self-confidence (McSporran & Young 2001; Yoo & Huang, 2013). Similarly, female students' self-esteem perceptions and academic commitment towards to online courses it were found to be higher than male students (Price, 2006). Accordingly, it can be said that the results obtained in favor of women in previous studies are consistent with the results of this study and confirm the results obtained from the study.

In the study, it was observed that students' attitudes towards distance education differ significantly according to their internet Access status. Research findings show that students who have regular internet Access benefit better from distance education. Similarly, Kirali and Cinar (2016) stated that students with internet Access have more positive attitudes towards distance education than students without internet access. On the other hand, in the study conducted by Ozyurek et al., (2015) it was seen that 28.73% of the students could not Access the courses properly due to the internet connection problem. Sercemeli and Kurnaz (2020) stated that students cannot access distance education courses due to their lack of sufficient internet quota. Anvar and Adnan (2020), Dutta and Smita (2020) also stated that technical and financial problems related to distance education applied during the epidemic period negatively affected the internet access status of students. These results show that one of the most common problems in distance education is regular internet access. Also, problems with internet access in distance education may cause inequality in active learning. The results of the research also reveal that in distance education, the use of online learning, videos, pictures and various files, the applicability of this education method and regular internet access is important.

In the study, it was observed that students who regularly attend courses have higher attitudes towards distance education than students who do not attend regularly. Therefore, it can be said that regular attendance in courses in distance education is effective in the high attitudes of students. These results also show that students understand that under any circumstances, attending classes regularly contributes to continuing education without interruption and to academic success. Mishra et al., (2020) Although there were some problems at the beginning of the participation in online courses during the COVID-19 period, it was observed that students' interest in online courses gradually increased and they did not have problems with regular participation in the course. Similarly, Ayvaci and Bebek (2016) stated that students are more eager to take courses given by distance education and this reflects positively on students' regular participation in classes. On the other hand, Tunga and Inceoğlu (2016) stated that the regular participation levels of students in distance education are lower than formal education. Ozgol et al., (2017) stated that the fact that students do not have to attend classes in distance education negatively affects participation, as there is no instructor to interact with in distance education as in face-to-face education. In the same study, they stated that the courses accumulate because they do not follow the courses regularly in distance education and this leaves students in a difficult situation. In the study conducted by Balikcioğlu et al., (2019), it was observed that 53.7% of the students did not regularly attend distance education courses. Courses can be listened to again in distance education, lack of sufficient control mechanism to ensure regular participation as in formal education, etc. In addition, problems such as internet connection problems, insufficient technical infrastructure, the inexperience of students in using the distance education system can be shown among the factors that prevent students from regularly attending classes. Mishra et al., (2020) stated that the technical problems experienced in the internet connection negatively affected the participation in online courses in distance education applied during the COVID-19 period. It can be said that the elimination of such problems may positively affect students' regular participation in online classes.

In the study, it was observed that students who were not disturbed while attending distance education courses had higher values in the sub-dimension of e-learning disposition than students who were disturbed. However, in the e-learning avoidance sub-dimension, it was observed that students who were disturbed while attending distance education courses had higher values than students who were not disturbed while attending distance education courses. It has been observed that there are old and new studies similar to the results of this study in the literature. For example, in the study conducted by Kay et al., (2020), it was observed that online courses provide students with a more comfortable study area and students focus better on the courses. In the study conducted by Ozyurek et al., (2015), it was observed that 18.27% of the students had problems arising from the family environment while listening to the courses. Sindiani et al., (2020) stated that students' academic success declined because they could not listen to courses in a calm environment during online courses. According to these results, the fact that most of the members are at home due to the social isolation applied during the epidemic may have made it difficult for students to follow the courses without being disturbed in the home environment. Therefore, it can be said that the appropriate environment for listening to distance education courses is important in terms of motivating students and understanding the courses better.

In the sub-dimension of e-learning tendency of the students participating in the study, it was observed that the students who found distance education applied during the epidemic beneficial had higher values than the students in the other group. These results show that students adapt to distance education applied in case of sudden situations. Atay (2020) states that in the study examining the attitudes of students towards distance education applied in the COVID-19 period, students are satisfied with the distance education applied during the COVID-19 period, and that they find distance education useful in cases where face-to-face education cannot be done for various reasons and in terms of supporting in-class education. Sindiani et al. (2020) stated that students find distance education useful because online courses applied in the COVID-19 period help maintain social distance and reduce school expenses. Previous studies also confirm these research findings. For example, Gregory and Lodge (2015) observed that students found distance education useful due to the opportunities it provides in listening to the distance education courses from the recording and accessing various courses and materials. On the other hand, in the e-learning avoidance sub-dimension, it was observed that students who did not find distance education applied during the epidemic period beneficial had higher values than the students in the other group. These results show that students who are used to formal education have difficulties in adapting to distance education. In a study by Ozgol et al., (2017) in which students evaluated distance and formal education, they stated that students who came to the university with the expectation of receiving face-to-face education did not care about distance education as much as formal education, found distance education boring, and did not get enough efficiency from some courses given by distance education. In the same study, they stated that students felt lonely because of distance education and this reduced their desire to participate in the lesson. A similar opinion is also stated in Ayvaci and Bebek's (2016) research. Also, they stated that students made correspondence and exchanges that are not related to the lesson in online courses and that this harmed the seriousness of the lesson. Bayram et al., (2019) stated that physical education and sports college students' attitudes towards the advantages of distance education lessons were low. In the studies of Kurtuncu and Kurt (2020), it was stated that students thought that sufficient efficiency could not be obtained from both the or etical and applied courses in distance education applied due to COVID-19. Khalil (2020) stated that students are not satisfied with the distance education carried out during the COVID-19 period. Therefore, he stated that students do not find distance education courses as beneficial as the courses in the regular classroom environment. Nenko et al., (2020) stated that the distance education carried out during the COVID-19 period could not meet the needs of the modern information society in its current state. In Sercemeli and Kurnaz (2020), noting that teaching courses with distance education during the COVID-19 period is not as beneficial as the courses taught in formal education, students do not feel well psychologically in this period, so homework, exams, etc. They stated that they could not focus. These results can be interpreted as that students do not see distance education as an adequate and useful education method due to various problems experienced in the distance education system. Also, the fact that the current research was conducted during the COVID-19 epidemic period and the psychological and social consequences caused by the epidemic may have affected the way students evaluate distance education. Because the students participating in the research came to the university by preferring formal education and focusing on this form of education. Telli Yamatomo (2006) stated that the campus experience is one of the most important factors in students' university life, and the location of the campuses and the various facilities in the mare a center of attraction for students. Switching to distance education quickly due to the epidemic may cause students to have difficulty in adapting to this transition and not to get enough efficiency from this education.

As a result, the COVID-19 epidemic, which deeply affected the education and training system in many countries, caused students to be unprepared for this sudden situation they had not seen before. It is observed that while the courses taught with the formal education method under normal conditions are tried to be continued with distance education, the process remains uncertain in the teaching of applied courses. As a result of the research, it was seen that the state of internet access, the technical infrastructure used, the online listening environment and regular attendance to the lessons affected the adaptation and motivation of the students to the distance education system. Therefore, while some students adapte asily to the distance education process, it is seen that some students have adaptation problems and do not get enough efficiency from distance education.

Distance education applied in this period is not a choice, but a necessity caused by the epidemic. For this reason, universities should be prepared for possible future crises and epidemics and have a crisis management plan that they can implement in such compulsory situations. It is thought that in the face of sudden developments such as the COVID-19 epidemic, it is necessary to make sudden situation planning for the use of distance education, to alleviate the anxiety of students in this period, to eliminate the lack of concentration and to raise more awareness of students about distance education. It will also be useful for educators to design learning programs that will alleviate student anxiety and ensure the online participation of students during this period. Also, accelerated remedial lessons can be implemented after the epidemic for practical lessons that students cannot see. The sample group of the present study is not large enough to detect small correlations. This situation may limit the generalizability of the results revealed in the research findings and the strength of the claims about the research results. For this reason, the use of methods that will enable more in-depth analysis on the subject in future studies will contribute to obtaining stronger and more useful results.

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## REFERENCES

Abbasi, S., Ayoob, T., Malik, A., & Iqbal, S. (2020). Perceptions of students regarding E-learning during COVID-19 at a private medical college *Pak J Med Sci.* 2020 May; 36 (COVID-19-S4): S57 S61. doi:10.12669/pjms.36.COVID19-S4.2766

Atay, D., (2020). COVID-19 donemi uzaktan eğitim raporu [COVID-19 era distance education report]. Retrieved May 05, 2020 from https://bau.edu.tr/icerik/15707-bau-uzaktan-egitim-raporu

Anca, P., & Cosmina, M., (2015). Students' perception on using e Learning technologies. *Procedure-SocBehavSci.* 2015; 180: 1514–1519. doi:10.1016 / j.sbspro.2015.02.300. [Google Academic]

Antalyali, O. L. (2004). Uzaktan eğitim algisi ve yonleylem araştirmasi dersinin uzaktan eğitim ile verilebilirliği [Distance education perception and the ability of the course of operation sresearch to be taught by distance education] (Master's dissertation), Suleyman Demirel University Institute of Social Sciences, Isparta, Turkey. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 148496.

Anvar, K., & Adnan M. (2020). Online learning amid the COVID-19 pandemic: Students perspectives. Journal of Pedagogical Research 1(2):45-51 DOI: 10.33902/JPSP.2020261309

Ayvaci, H. Ş., & Bebek, G. (2016). Determination of students' opinions about the application of general physics-II course with distance education software. *10th International Computer and Instructional Technologies Symposium* (pp. 1-6). Recep Tayyip Erdogan University, Rize

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Hum Behav & Emerg Tech.* 2020; 2:113–115. 10.1002/hbe2.191 [CrossRef] [Google Scholar] Hum Behav Emerg Technol. 2020 Apr; 2(2): 113–115. Published online 2020 Apr 7. doi: 10.1002/hbe2.191

Balikcioğlu, N., Cinar Oz, D., & *Işin, N. (2019).* Universite oğrencilerinin uzaktan eğitim derslerindeki memnuniyet araştirmasi: Aşik Veysel meslek yuksekokulu orneği [The satisfaction survey of university students in distance education courses: Aşik Veysel vocational school example]. *Cumhuriyet University Journal of Economic and Administrative Sciences,* 20 (1), 462-473. https://dergipark.org.tr/tr/pub/cumuiibf/issue/45599/544303

Bayram, M., Peker A.T., Aka S.T., & Vural, M., (2019). Universite Oğrencilerinin Uzaktan Eğitim Dersine Karşi Tutumlarinin Incelenmesi [Investigation of University Students' Attitudes towards Distance Education Course]. *Gaziantep University Journal of Sport Sciences,* 4 (3), 330-345.

CoHE, (2020). [(Higher education institution)]. *Press briefing.* Retrieved May 17, 2020 from https://www.yok.gov.tr/sayfalar/haberler/2020/universiteler¬de-uygulanacakuzaktan-egitime-iliskin-aciklama.aspx

Daniels, J., & Thistlethwaite, P. (2016). Being a scholar in the digital era. Bristol: Polity Press. De Koning, B., Tabbers, H., Rikers, R., & Paas, F. (2009). Towards a framework for attention cueing in instructional animations: Guidelines for research and design. Educational Psychology Review, 21, 113–140.

Dutta, S., & Smita M.K. (2020). The impact of COVID-19 pandemic on tertiary education in bangladeşh: students' perspectives, Open Journal of Social Sciences 8(9): 53-68. DOI: 10.4236/jss.2020.89004

Duşkun, Y. (2020). *Teaching under coronavirus conditions. COVID-19 crisis, Education reform initiative ERT education observatory* Rertieved July 09, 2020 from https://www.sivilsayfalar.org/2020/04/16/koronavirus-kosullarinda-ogretmenlik/

Efe, E., Bek, Y., & Şahin, M. (2000). Spss'te cozumleri ile istatistik yontemleri [Statictial methods with solutions in SPS] Kahramanmaraş: Rectorate of Kahramanmaraş Sutcu Imam University. Publication number:10.

Ekici, G. (2003). Uzaktan Eğitim Ortamlarinin Seciminde Oğrencilerin Oğrenme Stillerinin Onemi [The Importance of Students' Learning Styles in Choosing Distance Education Environments]. *Hacettepe University Journal of Education,* Issue: 24, 48-55.

Eğrican, N. (2011). *The reasons why girls are more successful than boys in education,* Tesisat Dergisi, Number: 187, 36-37. Retrieved July 09, 2020 from http://www.tesisat.com.tr/yayin/181/egitimde-kizlarin-erkeklerden-daha-basarili-olma-nedenleri_3173.html#.XxWYP54zbIW

ETF, (2020). *Coping with COVID-19: Mapping education and training responses to the health crisis in ETF partner countries.* Torino, Italy: ETF Publishing.

Fidalgo, P., Thormann, J., & Kulyk, O. et al. (2020). Students' perceptions on distance education: A multinational study. *Int J Educ Technol High Educ* 17, 18 https://doi.org/10.1186/s41239-020-00194-2

Gregory, M. S. J., & Lodge, J. M. (2015). Academic workload: the silent barrier to the implementation of technology-enhanced learning strategies in higher education. *Distance Education,* 36(2), 210-230. doi:10.1080/01587919.2015.1055056

Haznedar, O. (2012). Lisans oğrencilerinin bilgi ve iletişim teknolojisi becerilerinin ve e-oğrenmeye yonelik tutumlarinin farkli de*ğişkenler acisindan incelenmesi* [Investigation of undergraduate students' information and communication technology skills and attitudes towards e-learning in terms of different variables]. (Master's dissertation). Dokuz Eylul University, Institute of Educational Sciences, Izmir, Turkey. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 317659.

Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., Xiao, Y., & Cao, B. *(*2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet, 395 (10223), 497-506. pii: S0140-6736 (20): 30183-5. https://doi.org/10.1016/S0140-6736(20)30183-5

Karasar, N. (2018). *Bilimsel Araştirma Yontemi: Kavramlar, Ilkeler, Teknikler [Scientific Research Method: Concepts, Principles, Techniques]* Ankara: Nobel Publishing House.

Kay, D., & Pasarica, M. (2019). Using technology to increase student (and faculty satisfaction with) engagement in medical education Adv. *Physiol. Educ.,* 43 (3): 408-413, https://doi.org/10.1152/advan.00033.2019

Kayri, M. (2009). Araştirmalarda gruplar arasi farkin belirlenmesine yonelik coklu karşilaştirma (post-hoc) teknikleri [Multiple comparison (post-hoc) techniques to determine the difference between groups in research]. *Firat Universty Journal of Social Science*, 1, (19), *55*.

Khalil, M. (2020). Not by choice–Distance Education during the COVID-19 crisis. Retrieved July 09, 2020 from https://www.researchgate.net/publication/341150922_Not_by_choice__Distance_Education_during_the_COVID-19_crisis

Kirali, F.N., & Alci, B. (2016). *Universite oğrencilerinin uzaktan eğitim algisina ilişkin goruşleri* [University students' views on distance education perception]. *Istanbul Aydin University Journal* 30, (55-83).

Kottasova, I., & Isaac, L. (2020). *Italy shutsall schools over coronavirus outbreak. edition.cnn.com:* Retrieved July 22, 2020 from https://edition.cnn.com/2020/03/04/europe/italy-schools-closures-coronavirus-intl/index.html

Korkut Gencalp, D. (2020). COVID-19 salgini doneminde ilk ve acil yardim oğrencilerinin beslenme alişkanliklari ve fiziksel aktivite durumlarinin değerlendirilmesi [Evaluation of nutritional habits and physical activity of first aid and emergency aid students during the COVID-19 outbreak]. *Journal of Paramedicand Emergency Health Services,* 1 (1), 1-15. https://dergipark.org.tr/tr/pub/pashid/issue/54395/730372

Kurtuncu, M., & Kurt, A. (2020). COVID-19 Pandemisi doneminde hemşirelik oğrencilerinin uzaktan eğitim konusunda yaşadiklari sorunlar [The problems nursing students experience in distance education during the COVID-19 Pandemic]. *Journal of Eurasian Social and Economic Studies,* 7 (5), 66-77. https://dergipark.org.tr/tr/pub/asead/issue/54658/725503

Lau, J., Yang, B., & Dasgupta, R. (2020). Will the coronavirus make online education go viral? Times higher education.com: Retrieved May 17, 2020 from https://www.timeshighereducation.com/features/will-coronavirus-make-online-education-go-viral

McSporran, M., & Young, S. (2001). 'Does gender matter in online learning?', in *Association of Learning Technology Journal*, 9: 2,3-14.

Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic, Innternational Journal of Educational Research, 100012, https://doi.org/10.1016/j.ijedro.2020.100012

Nenko, Y., Kybalna, N., & Snisarenko, Y. (2020). The COVID-19 Distance Learning: In sight from Ukrainian students. Rev. Bras. Educ. Camp., 5, e8925. http://dx.doi.org/10.20873/uft.rbec.e8925

Pfleger, P. (2020). *The Challenges Of Online-Only Classes During Coronavirus Outbreak.* Retrieved July 22, 2020 from npr.org: https://www.npr.org/2020/03/12/814824067/the-challenges-of-online-only-classes-during-coronavirus-outbreak

Price, L. (2006). Gender differences and similarities in online courses: challenging stereotypical views of women, in *Journal of Computer Assisted Learning*, 22, 349-359.

Reimers, F. M. (2020). *What the COVID-19 Pandemic will change in education depends on the thoughtfulness of education responses today. Worlds of Education*. Retrieved July 22, 2020 fromhttps://www.worldsofeducation.org/en/woe_homepage/woe_detail/16727/%E2%80%9Cwhat-the-covid19-pandemic-will-change-in-education-depends-on-the-thoughtfulness-of-education-responses-today%E2%80%9D-by-fernando-mreimers

Sercemeli, M., & Kurnaz, E. (2020). COVID-19 Pandemi doneminde oğrencilerin uzaktan eğitim ve uzaktan muhasebe eğitimine yonelik bakiş acilari uzerine bir araştirma [A research on students' perspectives on distance education and distance accounting education during the COVID-19 Pandemic]. *Journal Of International Social Sciences Academic Researches*- C: 4 / S: 1 Year: 4- (1).

Sindiani, A.M., Obediat, N., Alshaifat, E., Elsalem, N., Alwani M.M., Ravashdeh, H., Fares, A.S., Alalavne, T., & Tawalbeh L.I., (2020). Distance education during the COVID-19 outbreak: A cross-sectional study among medical students in North of Jordan, 59, 186-194. https://doi.org/10.1016/j.amsu.2020.09.036

Telli, S., & Altun, D. (2020). Coronavirus ve Cevrimici (Online) Eğitimin Onlenemeyen Yukselişi [The Coronavirus and the Unavoidable Rise of Online Education]. *Journal of University Studies,* 3 (1), 25-34. doi: 10.32329 / uad.711110

Telli Yamamoto, G. (2006). University evaluation-selection: a Turkish case. *International Journal of Educational Management,* 559-569, (20),7.

Togoh, I. (2020). *Coronavirus Latest: Italy Shuts All Schools And Universities As COVID-19 Cases Rise.* forbes.com: Retrieved May 09, 2020 from https://www.forbes.com/sites/isabeltogoh/2020/03/04/corona-virus-latest-italy-shuts-all-schools-and-universities-as-COVID-19-cases-ise/#3160dff73c56

Tunga, Y., & Inceoğlu, M. M. (2016). Investigation of theuse of gamification approach in e-learning environments on the motivation of learners. *10th International Computer and Instructional Technologies Symposium* (pp. 620-625). Recep Tayyip Erdogan University, Rize.

*Ozgol, M., Sarikaya, I.*, & Ozturk, M. (August 2017). *Orgun eğitimde uzaktan eğitim uygulamalarina ilişkin oğrenci ve oğretim elemani değerlendirmeleri* [Student and instructor evaluations on distance education practices in formal education]. *Journal of Higher Education and Science*, 7 (2), 294-304.

*Ozyurek, A., Begde, Z., Yavuz, N.,* & *Ozkan, I. (2016).* Uzaktan Eğitim Uygulamasinin Oğrenci Bakiş Acisina Gore Değerlendirilmesi [Evaluation of Distance Education Application According to Student Perspective]. *Karabuk University Journal of Social Sciences Institute,* 6 (2), 595-605. https://dergipark.org.tr/tr/pub/joiss/issue/30780/323661

UNESCO, (2020). *Teacher Task Force calls to support 63 million teachers touched by the COVID-19 crisis.* UNESCO. Retrieved May 18, 2020 from https://en.unesco.org/news/teacher-task-force-calls-support-63-million-teachers-touched-COVID-19-crisis

Wilkinson, A., Roberts, J., & While, A.E. (2010). Creating a tool to measure student information and communication technology skills, e-learning experiences and attitudes, *Computers in Human Behavior*, 26, p. 1369-1376.

Yoo, S.J., & Huang, W.D. (2013). Engaging online adult learners in higher education: motivational factors impacted by gender, age, and prior experiences, *Journal of Continuing Higher Education* , 61 (3): 151-164. Available from: https://doi.org/10.1080/07377363.2013.836823

# TELEHEALTH FOR FAMILIES OF CHILDREN WITH SPECIAL NEEDS: EXPERTS' OPINIONS

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## ABSTRACT

Telehealth interventions (TI) are broadly defined as the use of information and communication technologies to deliver information, diagnosis, or educational services. While the use of TI was previously just a choice to support children with special needs and their families, they have become a necessity nowadays when performing face-to-face education and training practices are almost impossible. The current qualitative study aims at describing the opinions and recommendations of the experts toward the basic characteristics of TI, guidelines for successful practices, ethical considerations, potential problems, and solutions associated with TI process. Six experts experienced with implementing and conducting research on remote training and coaching participated in the semi-structured interviews that were transcribed and analyzed using content analysis. The analysis revealed four themes: (a) Characteristics of TI, (b) important points in TI, (c) potential problems, and (d) potential solutions. Overall, the findings may shed light on the general conceptual and terminological definition of TI, discussions regarding to feasibility of TI in Turkey, and effective TI practices. Also, the findings may guide future practitioners, researchers, or teachers in conducting or investigating the effectiveness of TI.

**Keywords:** Telehealth, developmental disabilities, family training, expert opinion, remote coaching.

## INTRODUCTION

After the outbreak of Corona Virus in Wuhan, a city in China, in 2019 spread throughout the world in a very short time, the World Health Organization (WHO) declared the emerging situation as a new pandemic in March 11 when it was first seen in Turkey (WHO, 2020). The new COVID-19 pandemic has affected many aspects of daily life, health, and education in particular (Goplani & Gupta, 2020). In fact, cutting face-to-face education to reduce coronavirus transmission at schools has led to seeking for a new educational model. In Turkey, for example, face-to-face education was stopped on the 26th of March and Ministry of National Education decided to perform courses on an online educational platform, Educational Informatics Network (EBA), and national television channel (i.e., TRT). Moreover, such platforms as Zoom, Google Teams, Hangouts, and Skype were common in delivering educational services during the distance education process (Yilmaz, Mutlu, Guner, Doganay, & Yilmaz, 2020).

However, problems in accessing educational services arose due to lack of technology such as internet or computers, and education not focusing on individual students' needs (Budak & Korkmaz, 2020). In other words, distance education did not provide all students with an equal right to access education. Obviously, students with special needs were placed on the top who could not equally benefit from educational services as those with typical development. Benefitting from those services more as long as individualized educational programs are implemented in face-to-face, one-to-one or small group instructional format (Tekin-Iftar, 2009), students with special needs have been interrupted in receiving proper educational services during the pandemic (Can, 2020). Thus, in has been inevitable to empower the environment, parents in particular, for these students who have not benefitted from the services sufficiently. Also, the parents of these students have had to play the teachers' role in addition to their own parental roles (Tarbox et al., 2020), which has made family-centered practices much more necessary during the pandemic.

Family-centered practices are implemented by delivering training, consultation or coaching support in natural (e.g., home) or structured settings (e.g., through internet) to the parents to provide their children with more learning opportunities, and to ensure more quality interaction and engagement with them (Reagon & Higbee, 2009; Wong, 2014). Literature suggests five basic components for the success of family-centered practices as follows (Longo, de Campos, & Schioriti, 2020): (a) Improving collaboration, (b) setting goals for the child and the parents, (c) employing goal-oriented evidence-based practices and developing home programs, (d) delivering continuous support and coaching to parents, and (e) evaluating the outcomes as a team. These steps clearly highlight the significance of implementing evidence-based practices and of training and coaching for the families of children with special needs. There exists a great number of interventions for the individuals with special needs; however, today's world requires a non-face-to-face practices due to the pandemic one of which is telehealth intervention(s) (TI) (Ferguson, Craig, & Dounavi, 2019).

Telehealth is broadly defined as the use of information and communication technologies to deliver information, diagnosis or educational services (Nickelson, 1998). TI can be delivered through a wide variety of communication technologies such as telephone, e-mail, or videoconferencing platforms (Phillips, Vesmarovich, Hauber, Wiggers, & Egner, 2001). Through telehealth, an expert can provide coaching to families that is defined as providing individualized teaching and feedback (Griffiths, 2020). Recent research reveals that a gradually growing interest in the use of TI for the families of children with special needs (Ferguson et al., 2019). In fact, previous research findings on telehealth suggest that most TI included applied behavior analytic procedures for the families of children with autism spectrum disorder (ASD) (Vismara, McCormick, Young, Nadhan, & Monlux, 2013), and that the families could implement the procedures with high procedural fidelity and stated positive opinions toward the procedure (Salomone et al., 2017) and the children could acquire the skills targeted for them (Boisvert & Hall, 2014). Also, TI reduce the educational costs by half (Horn et al., 2016), appear to be time-efficient and enable access to wider range of families (Lerman et al., 2020), thus maximizing the efficiency. However, research findings indicate that the success of TI is also dependent on families' access to technological equipment and being trained on how to use them (Lerman et al., 2020).

Although previous research mostly focused on the positive outcomes, limitations, and effectiveness of TI, it appears that there has been a growing interest in investigating the basic components, potential problems, and solutions during TI. For example, Romani and Schieltz (2017) described the ethical issues when delivering TI while Rios, Kazemi and Peterson (2018) provided information regarding to current challenges and recommendations to facilitate the process. In another research by Lerman and colleagues (2020), the experiences and suggestions of 18 practitioners engaging in telehealth on challenges and solutions while providing caregiver training were reported. It can be of high significance to describe the opinions and recommendations of primary experts regarding to TI that appear to be commonly used during the current pandemic context as well as post-pandemic. This information may help teachers, practitioners and researchers effectively design and implement TI process, and guide future research in this emerging area. Therefore, the purpose of the current study is to describe the opinions and recommendations of the experts experienced with implementing and conducting research on remote training and coaching toward the basic characteristics of TI, important points and guidelines for successful practices, ethical considerations, potential problems, and solutions associated with TI process. We think this information can guide the practitioners to design and implement TI effectively, thereby empowering families trained through telehealth practices in supporting their children with special needs.

## METHOD

### Research Design

The current study employed a qualitative case study research design. One or more cases are described in studies using a case study design (Yildirim & Simsek, 2016). Thus, the current study aimed at presenting the perspectives of the informants on the case of TI process and analyzing the phenomenon as a whole.

### Participants

The expert participants were identified after ethical consent had been gained from Ethics Committee at Hacettepe University. In identifying the participants criterion sampling, a kind of purposive sampling, was used because we intended to obtain in-depth information regarding to TI (Patton, 2002). Thus, the following inclusion criteria were used to include the participants in the research: (a) working in a special education field, (b) having experience with remote training and coaching, and (c) having conducted or conducting at least one research on remote training and coaching. To identify the participants meeting these criteria, YOKTEZ (National Theses and Dissertations Center), Google Scholar and Web of Science electronic databases were searched using the keywords, aile egitimi, uzaktan egitim, uzaktan kocluk, web tabanli egitim, tele-saglik (in English: parent training, remote training/distance education, remote/distance coaching, web-based training/education, and telehealth, respectively). Then, the researchers conducting research on remote training and coaching were contacted and asked information regarding to their experience with TI. The experts who conducted one or more studies on TI but did not have any experience with implementation were excluded. Because snowball sampling was also used in the study, the eligible participants were asked whether they could identify any other experts who could meet the inclusion criteria. As a result, a total of six participants volunteered and participated in the study. The demographic characteristics of the participants are presented in Table 1. Participant I also participated in the pilot interview session.

**Table 1.** Demographic characteristics of the participants

| | Age | Gender | Experience (years) |
|---|---|---|---|
| Participant 1 (P1) | 32 | Female | 8 |
| Participant 2 (P2) | 37 | Female | 14 |
| Participant 3 (P3) | 50 | Female | 29 |
| Participant 4 (P4) | 43 | Female | 20 |
| Participant 5 (P5) | 34 | Male | 11 |
| Participant 6 (P6) | 35 | Female | 10 |

### Data Collection

In-depth interview data were collected using a semi-structured interview form. Thus, interview questions were developed; however, additional questions were directed to the participants during the interview in accordance with their responses. This flexibility helped the researchers gather more in-depth and richer information regarding to TI (Fylan, 2005).

#### Semi-structured Interview Form

Database searches were conducted to determine the questions to be asked during the interviews. Also, interview questions were analyzed in previous research on TI where opinions of practitioners or teachers were described. At that point, authors were e-mailed and asked to share the interview questions that were not reported in the research (e.g., Lerman et al., 2020). Finally, a question pool was generated for the interviews. Then, the relevant questions were chosen in the pool and sent to two experts in special education department for review. According to their views, the interview form that included eight open-ended interview questions were finalized. The form focused on participants' own definition of TI, and opinions toward their usage in supporting families of children with special needs, important points, ethical issues and guidelines for ideal telehealth practices, potential problems and solutions associated with telehealth process. Before commencing interviews with the participants, a pilot interview session was conducted with another participant.

### Pilot Interview Session

This session was conducted with a participant who met inclusion criteria for participation. A synchronous online video-conferencing platform was used for the interview that was digitally audiotaped and recorded. The participant interviewed in the pilot interview session was 32-year-old female experienced in special education field for eight years. The session was carried out the time both interviewer (the first author) and the participant agreed upon through a video-conferencing platform to which the participant opted. When the interview was terminated, her opinions were taken toward the suitability of the questions and whether there were any questions to change, add or omit in the form. However, no changes were made in the questions in accordance with her views. Then, the authors together listened to the audio recording and decided that the questions were suitable with the aim of the study, there was no need to change or edit any of the interview questions, and to ask the later interviewees whether they would like to add anything else to their responses regarding to the questions that would not have been asked yet instead of not directing that question.

### Interviews

The volunteer participants who met the inclusion criteria were contacted and offered the mode of participation as well as the interview time options. All participants opted or agreed to conduct the interviews through a video-conferencing platform, Zoom. All interviews were digitally audiotaped and recorded. The participants were informed that the meeting would be audiotaped and recorded, protection of the information would be ensured, and they could withdraw at any time, and their consent was verbally obtained before initiating the interviews.

**Table 2.** Date, time, and length of the interviews

| | Date | Time | Length |
|---|---|---|---|
| P1 | 20 September 2020 | 15.38 | 30m 12s |
| P2 | 23 September 2020 | 12.05 | 22m 44s |
| P3 | 01 October 2020 | 21.49 | 33m 09s |
| P4 | 04 October 2020 | 18.37 | 21m 49s |
| P5 | 05 October 2020 | 14.09 | 44m 56s |
| P6 | 07 October 2020 | 10.34 | 32m 52s |

*Note. m = minutes, s = seconds*

During the interviews, the order of the questions was changed when needed or the question was clarified if the participant could not completely comprehend it, and additional questions were asked to obtain in-depth and richer information. For example, while P2 stated that TI may not work for some children, she was asked the question, "Who exactly do you think TI do not work?". The date, time and length of the interviews were presented in Table 2. The interviews lasted 31m and 09s in average (Range = 21m 48s. – 44m 56s). In the study, as transcriptions were analyzed, a second interview was arranged for P2 and P5 who were asked to further clarify anything they wished or specify where they dis/agreed with the analysis.

## Data Analysis

The data was analyzed using content analysis. Because no change was made after the pilot interview session, the data collected from the participant in that session was also included in data analysis. First, the audio recordings were transcribed in page- and line-numbered Microsoft Word documents and read through by the authors. Second, open coding, creating categories and thematization (abstraction) were carried out during content analysis process (Elo & Kyngas, 2008). In open coding, codes were given to describe the aspects of the content thought to be reflective, and a coding sheet was generated. The transcriptions were read again due to different coding in the coding sheets generated for each participant. After this open coding, categories were freely created, and themes were generated through the concepts that the themes represented (Yildirim & Simsek, 2016). This process was independently performed by each author. In this process, the authors stated their opinions, discussed, and agreed on the coding in case of any discrepancies. Then, they finalized the coding, categories, and themes. As a result, 15 categories and 4 themes were generated.

## Trustworthiness

In qualitative research, such criteria as credibility, transferability or dependability are used instead of reliability or validity (Yildirim & Simsek, 2016). For credibility purposes, the interviews in this study were transcribed and the transcriptions were sent to the participants for respondent validation. Next, two participants re-volunteered for the second interview were interviewed for member checking to ensure the validity of the findings. For transferability purposes, study procedure and the stages (e.g., identifying the participants, developing interview questions, interviews, data analysis) were written down in detail, and direct citations were used in reporting the findings. Also, the use of purposeful sampling contributed to transferability. Furthermore, we aimed at strengthening the consistency by validating the transcriptions and ensuring coding consistency. For this purpose, an independent expert who worked as a research assistant in psychological counselling and guidance field and conducted qualitative research after taking lessons on qualitative research methodology listened to all interview audio recordings and confirmed the accuracy of the transcriptions. Also, the expert, as an independent observer, checked each code, category, and theme in the related files that the authors developed upon data analysis. It was planned to come together and examine the content in case of any disagreements. Yet, there were no observed discrepancies.

# FINDINGS

The data obtained from the participants' responses toward telehealth interventions (TI) for families of children with special needs were analyzed in four themes as "characteristics of TI", "important points in TI", "potential problems", and "potential solutions". The themes and categories are presented in Figure 1. Also, we reported the findings by direct citations with participant codes, their page and line numbers. For example, "P6, 2, 57-58" in the citations refers to the participant, page number(s), and line number(s), respectively.

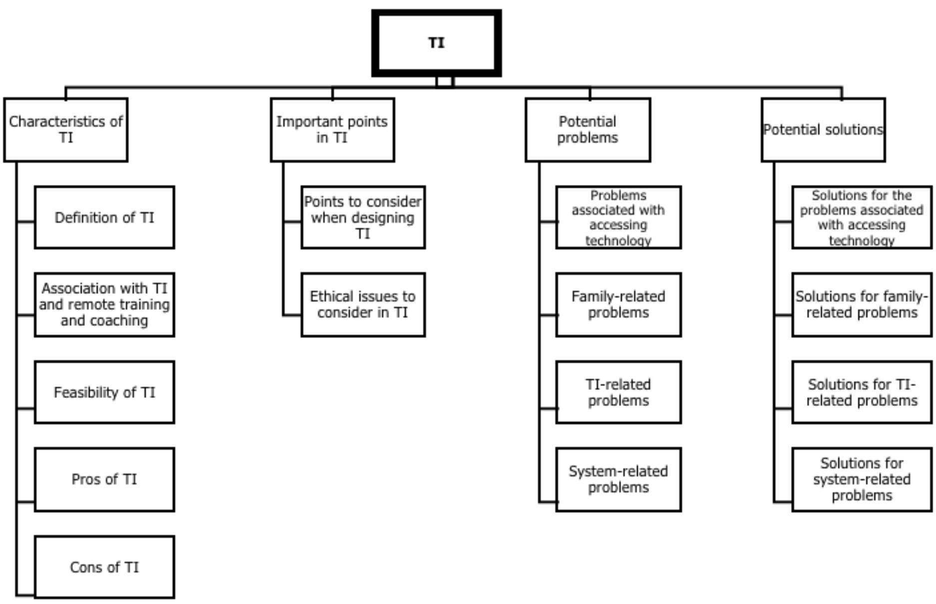


**Figure 1.** The themes and the categories in the study

### Theme 1: Characteristics of TI

The data in this theme, characteristics of TI, were analyzed in five categories as definition of TI, association with TI and remote training and coaching, feasibility of TI, pros of TI, and cons of TI. The categories and sub-categories within this theme are presented in Figure 2.

For *definition of TI* category, four participants defined TI as an interactive and active system that aims to teach information or skills needed by the individuals having difficulty accessing related services. They also mentioned that goal could be achieved through remote training and coaching. In that process, four participants stated online platforms could be used, and one participant different means of communication such as text messages or phone calls: "*I would not like to conclude the topic as internet. However, some things could be done through phone calls. Like texting, sending texts...* (P5, 3, 104-106)". One participant commented on this issue as "*It is a system that aims that families, who cannot access especially experts, can spend home hours, home context, home settings that the expert may not be able to access, or time periods in effective teaching* (P2, 2, 62-66)" while another said "*In my opinion, it [telehealth] is a health service to provide information... that is provided on internet* (P6, 2, 57-58)". Also, two participants said telehealth has been commonly used in the United States of America (USA). One of these participants indicated telehealth as a practice that families in the USA applied for to be able to utilize insurance system: "*Telehealth is a system and it is a system based on the economic structure* (P3, 3, 123); *[telehealth] is a way that families applied for to be able to utilize insurance system* (P3, 3, 126)".

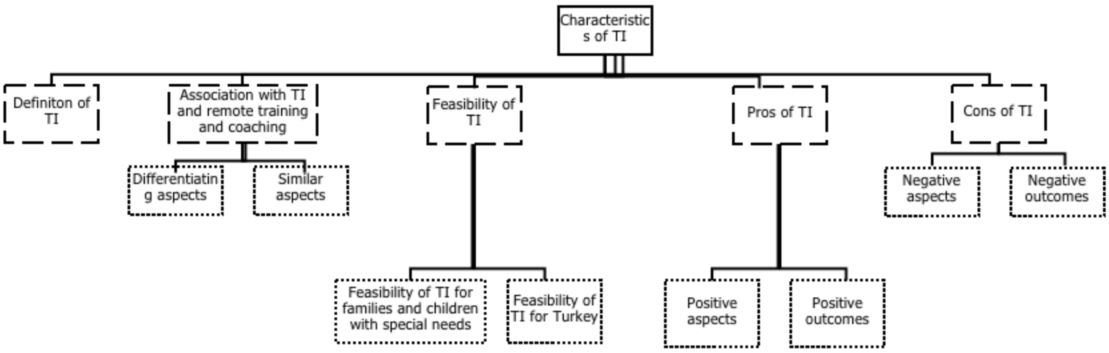


**Figure 2.** Categories and sub-categories of Theme 1

*Association with TI and remote training and coaching* category was analyzed within two sub-categories as differentiating aspects and similar aspects. All participants remarked telehealth and remote training and coaching are different from each other. Four participants commenting on differentiating aspects said telehealth was an umbrella term. Two of them focused on differentiating aspects especially on telehealth and coaching and indicated that telehealth was a multidimensional and broad system while coaching was a goal-oriented and limited system as the most differentiating aspect. One participant who conducted research on professional development said "*They are not same. There is a system. That system [telehealth] is completely web-based but has multiple dimensions. I mean it is not focused on only one domain like coaching. It is not a limited system to the needs of teachers, students, families or children like professional development practices that we had designed* (P2, 2, 58-62)". However, another participant commenting on differentiating aspects noted that coaching was an umbrella term in which telehealth was a means: "*Coaching is on the top, but I think we need to assume telehealth is a means in that [coaching]* (P3, 3, 117-118)". On the other hand, two participants talking about similar aspects stated that those two – telehealth and remote training and coaching – had similarities, the purposes, and procedures in particular. One participant discussed this as "*You may think telehealth does not differ from remote coaching. However, there is a reason why it is called as telehealth. That's what I'm trying to say* (P3, 3, 127)". Another said "*As a matter of fact, I see them [telehealth and remote training and coaching] similar because both tell us what should be done so that the child can acquire a target behavior or a skill. I also think they are similar in implementation procedures, purposes and rationales* (P5, 2, 74-76)". One participant (P6) noted that there are differences between them, and that there is a terminological confusion in literature in that researchers still have not arrived at an agreement on this issue.

Participants' opinions toward the feasibility of TI in supporting children with special needs were analyzed under the category of *feasibility of TI* that included two sub-categories. Five participants commented on feasibility of TI for families and children with special needs and indicated that TI could be a favorable way to support families and children with special needs during pandemic as well as post-pandemic. Also, all participants remarked TI could be an alternative to face-to-face education. The following quotes indicate the examples for that category: "*Erm, maybe none of us has experienced such a thing as pandemic before. We definitely should put it [TI] on our agenda... I think it is feasible. It is definitely an alternative to face-to-face education* (P2, 2, 69-78)", "*It [TI] can be feasible for all time, not just during the pandemic. I mean that the one-on-one practices that I have conducted indicate that remote training has a lot of pluses, especially in education field, for the families having a child with special needs* (P4, 2, 51-54)", "*My answer, for short-term, would be the pandemic, but we are going to do everything remotely from now on, so we can say we have transitioned into an online era* (P1, 2, 63-65)". Another category in that theme is *feasibility of TI for Turkey*. Three of the participants noted that TI should be examined whether it is feasible for Turkey, so they indicated a need to conduct research on a wide variety of issues such as structure of distance education, resources of families and teachers, and characteristics of coaches: "*Is it [TI] effective? So, is it effective in this culture? Does it work? Have we [academics] trained experts who can use that? Have these experts conducted that with high treatment fidelity? Or, can they? Or, have we taught them the skills how to conduct? If we can answer all these questions, then we can answer the question of 'Is it right to use it?', but we have not known that yet* (P3, 5, 204-208)".

The category, *pros of TI*, consisted of two sub-categories as positive aspects and positive outcomes. All participants mentioned TI as time-, cost- and transportation-efficient practice: "*Transportation, cost. It [TI] reduces both. It enables time flexibility. These are all of its pluses* (P4, 3, 97-98)". Moreover, one participant commented TI contributed to social distancing during the pandemic and eliminated physical contact, while another participant mentioned opportunities of developing family-oriented programs and instant responding to families' practices as positive aspects of TI: "*When it comes to remoteness, there are more pluses because you can see the parents, their home, and you are inside that home. Right, you are on a screen, but you see everything, and you can provide one-on-one help. You can see their [family's] errors, right practices and you have the chance to intervene in instantly* (P4, 2, 55-60)." In the sub-category of positive outcomes, participants' opinions were analyzed within TI's positive outcomes for family, family psychology and child development. Participants' opinions for this sub-category were related to parents' teaching skills to their children [e.g., "*If educated right, parents can implement evidence-based practices* (P3, 6, 231)"], parents' recognizing to contribute to their children's development [e.g., "*Don't we start believing in that we are able to be successful as we achieve things? Thus, TI has shown that families can perform positive things for their children* (P5, 6, 220-224)"], parents' recognizing that their children acquire lots of skills [e.g., "[There had existed] a *pessimism related to what their children could not do and in which they [parents] thought their children could not do that, could not do this... or [there had existed] an over-acceptance. I think it [TI] had positive impacts on these issues* (P5, 6, 229-232)"]. One participant discussed that TI reduced family stress, enhanced parent-child interaction quality, improved family motivation, and reduced family's desperateness, thus helping them see the future more positively with the following quotes: "*That [TI] has effects even on family stress, and on their expectations from the future. I mean mother-child or father-child will be spending more functional time together* (P2, 4, 135-137)", and "*I mean they [families] can minimize that desperateness they have, thus seeing the future more positively [thanks to TI]* (P2, 4, 151-153)". Three of the participants indicated positive outcomes of TI as allowing facilitated learning and supporting the skills that could not be taught at school: "*For example, some skills cannot be taught at school. They definitely should be learned at home settings. Because parents, now, notice that children are able to acquire them* (P5, 3-4, 129-132)".

The category of *cons of TI* consisted of two sub-categories as negative aspects and negative outcomes. Four participants mentioned positive aspects of TI. Two of them noted that TI required continuous interaction between the expert and family, while three stated TI was not suitable for every child, family or skill: "*Above all, it [TI] may not be as effective as face-to-face format for all children or families* (P2, 3, 92-93)" and "*Sometimes we cannot win, control, make eye-contract with the child during tabletop teaching. There are some times when we cannot perform even we [practitioner and child] are side-by-side or have difficulty. Maybe doing such thing [giving education] may create a few problems for our children, our group* (P1, 5, 178-184)". Further, only one participant mentioned that families could not maintain the skills they acquired through TI as negative outcomes: "*They talk about remote coaching, but families do not maintain implementing what they have acquired when the coaching is terminated* (P3, 6, 234-236)".

### Theme 2: Important Points in TI

The theme, important points in TI, was analyzed in two separate categories as points to consider when designing TI and ethical issues to consider in TI. The categories and sub-categories within this theme are presented in Figure 3.

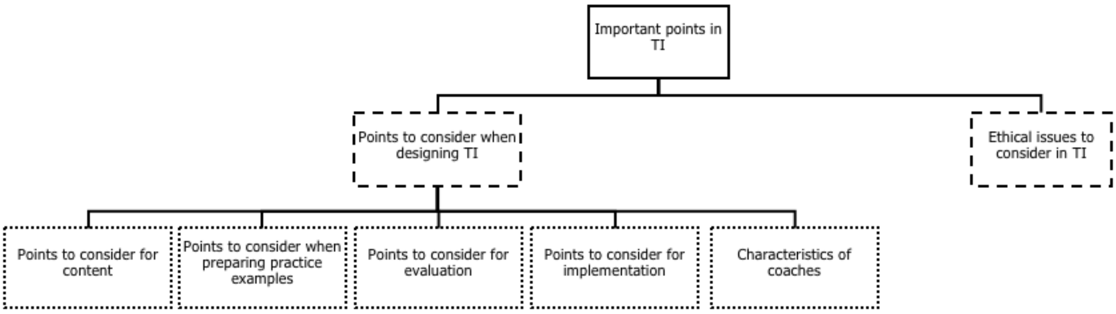


**Figure 3.** Categories and sub-categories of Theme 2

Regarding to the points to consider for content sub-category, all participants remarked that the content should be determined considering the needs of families so that TI could be effective: "*Here 'person-specific and situation-specific' things must be regarded. I mean we prepare individualized education programs considering the student. So, TI must include that individualization* (P5, 6, 236-239)."

Four participants talked about points to consider when preparing practice examples, and suggested preparing true video examples as well as false examples all of which was recorded using a model with special needs instead of a typically developing model: "*Erm, [there should be] video examples with a child with special needs recorded in a non-manipulated natural setting in which each implementation steps are clearly seen, and that even depicts how we [practitioners] effectively deal with problem behaviors or learning opportunities as we do in our daily teaching sessions, and that especially includes false examples, which allows additional learning* (P2, 4-5, 173-181)". Only one participant mentioned including self-evaluation system into the process might improve the effectiveness of TI, which is analyzed within the sub-category of points to consider for evaluation: "*If we teach them how they can evaluate themselves... I mean if we include it [self-evaluation] in the process, we can not only disseminate it, but also utilize the resources more efficiently* (P2, 5, 189-191)".

All participant stated opinions toward the points to consider for implementation and remarked providing families with feedback regarding to their practices and that the feedback must be given continuously and frequently. Two participants indicated that presenting the content in a short time using written, visual or auditory materials would facilitate the effectiveness of the practices: "*Erm, only info text or reading material may not be sufficient. I mean it [TI] should be supported by adding visual and auditory materials* (P6, 4, 135-137)".

Finally, all participants indicated that characteristics of coaches play a significant key role in the effectiveness of TI, thus suggested including coaches with specific qualifications when designing a TI. They noted the characteristics of coaches as follows: (a) experienced with teaching methods, remote training, knowing about and communicating with families, and assessment, (b) professional and technologic competence, (c) being supportive, open to self-development, explorer, motivating, respectful, leader, cooperative, accessible, empathetic, flexible, and being able to give supportive feedback. The following quote indicates some characteristics of a coach:

> *"Empathy. Being able to show empathy toward the family. They [coaches] definitely should have such a characteristic and can effectively communicate with families (P4, 5, 194-195)."*
>
> *"I think these are the two things that a coach must have: The language he/she uses and maybe being accessible all the time (P2, 5-6, 212-213)."*
>
> *"'You did it right.', 'Here, it is wonderful what you've just did.', 'Now, you need to do these.' Therefore, I can say having a positive point of view (P3, 7, 288-290)."*
>
> *"I think his/her [coach's] personality traits should include being motivative and supportive (P6, 4, 175-176)."*

Regarding to the category of *ethical issues to consider in TI*, all participants pointed out the principle of confidentiality as the basic ethical issue to consider. One participant remarked "*Such practices get us to have much data for sure. There are videos or photos. So, I think it is the responsibility of the coach to protect these and not to use them for any other purposes. Nobody else should reach them* (P5, 8, 312-315)." This principle was followed by being constructive in that three participants indicated that the practitioners of TI should be constructive: "*First, we [practitioners] focus on accurate behaviors, on what they [families] could do. Erm, starting from constructive and reinforcing feedback is the most ethical dimension* (P2, 6, 219-220)." In addition, participants commented on being respectful [e.g., "*I mean the first thing to come to the mind is respect when we think of ethics* (P5, 8, 303)"], improving personal and professional development [e.g., "*It is his/her [coach's] responsibility to follow evidence-based practices and to pursue professional development* (P3, 8, 308-309)"], giving consultation about the subjects that the coaches are competent in [e.g., "*So, he/she [coach] needs to perform practices within what he/she is competent in* (P3, 8, 311-314)"], and taking action in case of a neglect or an abuse [e.g., "*Also, properly* reporting *such things as neglect or abuse or so on occurring at home* (P3, 7, 297-298)"].

### Theme 3: Potential Problems

The data in this theme, potential problems, were analyzed in four categories as problems associated with accessing technology, family-related problems, TI-related problems, and system-related problems. The categories within this theme are presented in Figure 4.

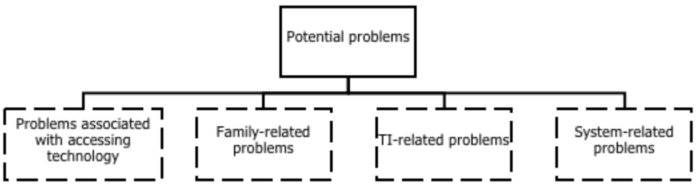


**Figure 4.** Categories and sub-categories of Theme 3

All participants commenting on problems *associated with accessing technology* talked about the problems resulting from families' and practitioners' not having internet and sufficient equipment (i.e., computer, microphone), and lack of knowledge on how to use technology: "*[TI] requires technical infrastructure for sure. We can assume it ranges from internet speed to technical equipment. It requires families have them and access them. Also, as a service provide, the practitioner is required to have a technical infrastructure such as continuous connection and so on. These are the issues where problems may arise* (P6, 6, 248-254)."

As to *family-related problems*, the data were analyzed within families' negative attitudes toward TI, not allocating enough time, being too time-flexible, being too protective of their children, assuming their privacy would not be protected, and discontinuing TI thinking they could not progress enough. Participants pointed out families' negative attitudes toward TI by remarking "*What I would like to say here is attitude. I mean the person should believe... [The person should] believe that some things could be achieved through this [TI]* (P5, 4, 180-181)." Also, the participants commented on families' being not allocating enough time: "*I mean the* *families may wish to get service but may also say they don't have time* (P6, 7, 261-262)." Further, the participants mentioned families' protective roles: "*Families have a problem that is being too protective of their children. That should be changed* (P2, 6, 250-251)." Moreover, the following quotes points at participants' opinion toward families' assuming their privacy could not be protected: "*I mean the families may have troubles about that special conditions regarding to their children are shared online, on internet* (P6, 6, 221-223).", and toward discontinuing TI thinking families could not progress enough "*Although the family... not the child... Although the family progressed so much, they wanted a practitioner who could come to their house due to the assumption that they could not progress as much as they expected* (P5, 5, 175-176)."

As to *TI-related problems*, the data were analyzed within the problems of implementation of TI and of qualifications of practitioners. One participant talked about problems due to remoteness: "*However remote it [TI] is, it requires an emotional gesture, mimic, or social interaction. So, we may not see all of these in TI as we do in genuine communication* (P5, 9, 356-359).", while another mentioned problems in assessment procedure in TI: "*I mean the problem about how you will assess the parent and the child* (P4, 5, 164-165)." On the other hand, the participants also discussed about the problems that may result from the qualifications of practitioners on implementing TI: "*Also, the professional development of the person who performs that practice and getting himself/herself competent. These fields [TI] are continuously developing* (P3, 8, 322-324)."

Lastly, only one participant talked about the problems that may result from lack of structure, human resources, and research shedding light on implementing the system in Turkey. Thus, the participant mentioned *system-related problems*: "*So, how can TI work in Turkey? Do we have enough number of coaches for TI?* (P3, 4, 134-136)."

### Theme 4: Potential Solutions

Participants' opinions toward potential solutions for the potential problems were analyzed in this theme. The categories within this theme are presented in Figure 5.

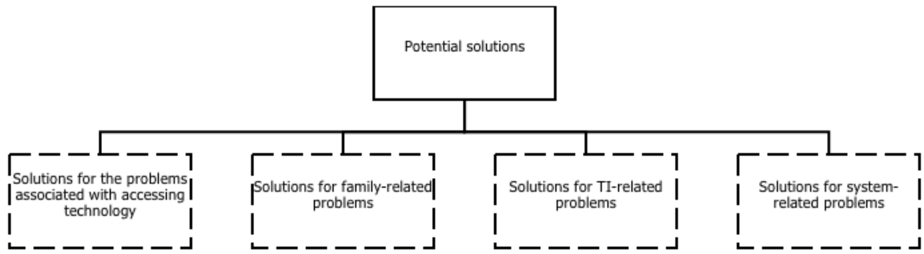


**Figure 5.** Categories and sub-categories of Theme 4

Regarding to *solutions for the problems associated with accessing technology*, the participants talked about solutions as providing families and practitioners with technologic infrastructure and equipment, and supporting families in how to use technology: "*If the countries spend their resources appropriately in accordance with social justice and if a system is developed based upon supporting the poor, then these are not the problems that cannot be solved especially by Turkey* (P3, 9, 336-338).", "*[There can be] resources that help families benefit from technology, which aims to improve the knowledge and skills of them – especially families of children with special needs. There can be trainings, brochures on that* [P2, 7, 266-268).", and "*If there will be distance education especially during the pandemic as well as post-pandemic, then this process can be organized by meeting beforehand when trainings can be performed [on how to use technology]. I mean this can be planned as a separate training, as a family training series. I think there should be some things toward planning distance education, toward what Zoom is or how it is used, for the families of children with special needs* (P1, 6, 201-208)."

Participants mentioned, in the category of *solutions for family-related problems*, solutions for improving family attitudes toward TI: "*We need to show the family how important it [TI] is and how the child has progressed. Then, they really take it seriously* (P4, 6, 238-240)." Also, the participants provided solutions for the problems related to time: "*You know, exclusive rights have been given to those who have such children [with* *special needs]. For example, for some jobs they can take one day off once a week now. So, they can spend that day with their children, or they can get permission during specific hours... I don't know, maybe a babysitter support can be provided to them* (P5, 11, 436-443)." The following quote indicates an opinion of a participant toward solutions for families' assuming their privacy would not be protected: "*They can be reassured that data of their children will be private and will not be shared with anybody. I mean... Maybe... A contract can be signed...* (P6, 7, 286-288)." Possible solutions stated by the participants for discontinuing TI thinking families could not progress enough are also noted: "*I mean if families do something good for their children, [believe that] they can be a good teacher or effectively touch lives of the children as much as a teacher does... Actually, they can be the best teachers ever. They know every characteristic of their children. If [a practitioner] succeeds in making the families trust in themselves...* (P2, 7, 274-278)."

One participant noted that, in the category of *solutions for TI-related problems*, providing TI through different ways apart from internet would prevent internet-related problems: "*There are families living in rural who do not access internet for sure, but here we don't only refer to internet by saying TI. You can make phone calls, send SMS. Or maybe because sending voice recordings is also a TI, we need to think about the whole* (P5, 9-10, 384,388)." One participant suggested solutions for the problems that may result from practitioners' limited qualifications: "*It is strongly important that we diversify undergraduate programs, I mean in terms of courses, and to train [students] with specific qualifications* (P3, 8, 325-328)."

Only one participant commented on *solutions for system-related problems*: "*Covid period well taught us that we need to raise awareness among undergraduate programs, our students, preservice teachers, and behavior analyst candidates. See many faculty members in the USA are conducting research on How to Teach Online, writing books, working on how they can teach children with special needs remotely. So, what have we done? Only one mobile application has been developed in Turkey by Ministry of National Education. I haven't seen anything, but that application. I mean we really should have been discussing these by now* (P3, 8, 322-325)."

## DISCUSSIONS AND CONCLUSION

The current study described the opinions and recommendations of the experts experienced with implementing and conducting research on remote training and coaching toward the TI for families. Their responses toward TI for families of children with special needs were analyzed in four themes as "characteristics of TI", "important points in TI", "potential problems", and "potential solutions". This section discusses the findings within each theme and provides directions for future research.

### Characteristics of TI

One of the themes developed in the study is "characteristics of TI". One of the categories in which most comments were stated within this theme is the definition of TI. The participants defined TI as an interactive and active system that is delivered to individuals having difficulty in accessing related services to teach them knowledge and skills through remote training and coaching. Although the participants remarked TI was delivered through remote training and coaching, they stated both concepts were different. In fact, four participants indicated telehealth was a wider concept than remote training and coaching, whereas one participant vice versa. Further, one participant noted that there was a conceptual confusion in literature. In literature, telehealth, in contrast to tele-medicine used for diagnosis or treatment, is defined as an umbrella term consisting of such practices as behavioral health, consultation and education training (Knutsen et al., 2016; Machalicek et al., 2016). Thus, telehealth can be regarded as a service delivery model for implementing remote training and coaching. However, it is notable that authors in previous research used different terms such as telehealth-supported coaching (Benson et al., 2018), telehealth coaching (Little, Dunn, Pope, & Wallisch, 2016; Young, Ward, & Tang-Feldman, 2014), or telehealth program (Alfurayda, Croxall, Hurt, Kerr, & Brophy, 2020). Also, the terms – telehealth, and remote training and coaching – were used synonymously (Kizir, 2019) or as different concepts (e.g., Wainer & Ingersoll, 2015) in previous research. This suggests that there is still a confusion and inconsistency regarding to the use and definition of these terms, so further research is required to establish the basic similarities and differences between the terms. Participants indicated that TI was an appropriate way to support the children with special needs and their families both during and after the exceptional circumstances. Considering the recent arguments of transitioning into a hybrid system in education (Ertan-Kantos, 2020), the present findings seem to be consistent with those of the recent research. Furthermore, three participants suggested that feasibility of TI for Turkey should be tested and mentioned a need for further research on this. Literature suggests that the feasibility of TI is questionable especially for developing countries due to a wide variety of reasons such as broadband connection, higher cost of hardware, and lack of practitioners (Kareem & Bajwa, 2011). This is consistent with the recommendations of the participants in this study upon the need of research investigating the feasibility of TI in Turkey. Feasibility of a practice should be determined according to its effectiveness as well as "cost-efficiency", "satisfaction", "compatibility with local values", and "easiness to use" (Fawcett, 1991). Thus, future research conducted in various geographical regions in Turkey is warranted to investigate the feasibility and acceptability – social validity -, compatibility with education system and culture, consumer satisfaction, cost-efficiency of TI, and when and whom for TI can be employed instead of face-to-face format. Findings on participants' opinions indicated that they mentioned pros more than the cons of TI that were requirement of continuous interaction with the family, families' not maintaining the acquired skills, and unsuitability of TI in every child, family, and skill. These findings on negative aspects of TI are consistent with those in previous research, which advances the literature (Bilmez, 2020; Iacono et al., 2016; Yang et al., 2020). These findings also indicate a need for future investigations on which characteristics the children, families and skills should have so that TI can be effective, under which circumstances TI can work (e.g., face-to-face pre-training prior to TI), and what should be done to maintain the acquired skills by the children or families. Finally, future studies may focus on describing expert opinions toward which children, families and skills TI may be suitable, and what adaptations should be performed for the children with various characteristics (e.g., duration of the meeting).

## Important Points in TI

The participants indicated a wide variety of points to consider, which will improve the effectiveness of TI, such as family-oriented content, true as well as false video examples, using videos including participants with special needs, continuous feedback for families, and inclusion of qualified coaches in TI. Iocano and colleagues (2016) state that volunteering as well as qualification of the practitioner are significant so that TI can be successful. Moreover, video examples for the families (Meadan et al., 2016), continuous feedback for families and family- and child-oriented target skills (Simacek, Elmquist, Dimian, & Reichle, 2020) play crucial roles in designing TI, which is consistent with the findings in our study. Thus, future research may compare the effectiveness and efficacy between two TI procedures in which true and/or false examples are used. Moreover, future research can investigate the effectiveness of TI in which families can perform self-feedback through checklists and can explore perceptions on the expected qualifications of a coach. In addition, the relevance and effectiveness of such components as homework, quizzes, multiple-choice assessment questions, forums, and diaries on the level treatment fidelity coefficient are also important issues for future research.

Participants' opinions about ethical issues regarding to confidentiality, constructive and respectful characteristics of the practitioners, maintenance of professional and personal development, and consultation within competent fields seem to be consistent with the ethical guidelines and codes of some organizations such as Behavior Analyst Certification Board (e.g., BACB 2.06 – *Maintaining* Confidentiality) and American Psychological Association. In addition, this finding is consistent with the checklist of ethical issues to comply during TI developed by Baumes, Colic and Araiba (2020). Thus, future researchers should use this recent emerging checklist and use platforms compliant with Health Insurance Portability and Accountability Act (HIPPA) (e.g., Zoom, GoToMeeting) that requires sensitive data protection so that potential and undesirable ethical results of TI would not arise.

## Potential Problems

Participants discussed problems associated with accessing technology, family, TI, and the system. In one study by Lerman and colleagues (2020), experiences and opinions of 18 practitioners who provided families with remote training and coaching were described. The authors reported most frequent challenges as technical issues (e.g., no access to equipment), challenges with remote viewing (e.g., difficulty to see or hear), disruptions in environment (e.g., interruption of sessions by family members), issues related to client's behavior (e.g., engaging in undesired behaviors), issues related to caregiver's behavior (e.g., emotional responding), and issues related to the practitioner (e.g., not being specifically trained for TI). In the current study, all participants not only mentioned same issues and challenges reported by that study, but also indicated system-related problems resulting from negative attitudes of families toward TI and lack of practitioners and infrastructure in Turkey. In fact, negative family attitudes may be unique to Turkey in that families are too protective of their children (Canatan, Konbak, Aslan, Ozdemir, & Yilmaz, 2020) and they are not familiar with remote training (Ak, Sahin, Cicekler, & Ergun, 2020). Further studies with more focus on examining these problems and challenges to improve effectiveness, efficacy and social validity of TI are therefore suggested. Also, future studies, which explore the opinions of service receivers (i.e., families) as well as service providers on potential problems during TI, will need to be undertaken.

## Potential Solutions

The recommendations of the participants experienced with implementing and conducting research on remote training and coaching for the solutions of potential problems may guide future researchers and practitioners in this emerging field, TI. These findings on potential solutions are not only consistent with those of Lerman et al. (2020) that described recommendations of service providers for challenges during TI, but also produced additional solutions for those unique to Turkey. In fact, the participants recommended improving family attitudes for discontinuation of TI, the use of various ways apart from internet for TI-related problems and performing awareness raising for system-related problems. Thus, some recommendations for the solutions seem to require short- and some long-term planning. For example, practitioners may establish a lending library for families and provide them with the equipment (e.g., microphone). On the other hand, long-term planning may include developing positive attitude among families toward TI, facilitating active participation, and training qualified practitioners. Thus, it is recommended that practitioners use data-based decisions and inform the family of children's progress, support families through corrective and constructive feedback, and hold the meetings in the way they do not negatively affect family participation (e.g., not interrupting family routine or using family preferred means of communication). There would, moreover, seem to be a definite need for developing effective educational models in training qualified practitioners and training practitioners in undergraduate programs who are qualified with remote training and coaching and comply with ethical issues. Thus, elective, or/and compulsory courses on remote training, remote coaching and telehealth can be commenced in Special Education departments at universities. Also, some parts of teaching practice/internship courses can be conducted remotely to improve preservice teacher's related skills.

The current study described the opinions of the experts experienced with implementation and research on TI in terms of various dimensions, and accordingly discussed precautions for feasibility and acceptability of TI for Turkey. The study explored the opinions of six participants eligible for the study, so it is limited to the opinions of them. Also, this can be regarded as a limitation for the literature on remote training and coaching. Although we used document analysis in identifying the participants, the data were collected only through conducting interviews with them. However, it is thought that this study provides significant contributions to Turkish literature in that it can shed light on future studies and researchers upon a newly developing and emerging area, TI.

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## REFERENCES

Ak, M., Sahin, L., Cicekler, A. N., & Erturk, M. A. Kovid-19 Kuresel salgin surecinde Istanbul Universitesi uzaktan egitim uygulamalarina genel bir bakis. *Istanbul Universitesi Sosyoloji Dergisi, 40*(2), 1-42. doi: 10.26650/SJ.2020.40.2.0076

Alfuraydan, M., Croxall, J., Hurt, L., Kerr, M., & Brophy, S. (2020). Use of telehealth for facilitating the diagnostic assessment of autism spectrum disorder (ASD): A scoping review. *PloS one*, *15*(7), 1-16. doi: 10.1371/journal.pone.0236415

Baumes, A., Colic, M., & Araiba, S. (2020). Comparison of telehealth-related ethics and guidelines and a checklist for ethical decision making in the midst of the covid-19 pandemic. *Behavior analysis in practice*, 13(4), 736-747. doi: 10.1007/s40617-020-00475-2

Benson, S. S., Dimian, A. F., Elmquist, M., Simacek, J., McComas, J. J., & Symons, F. J. (2018). Coaching parents to assess and treat self-injurious behaviour via telehealth. *Journal of Intellectual Disability Research*, *62*(12), 1114-1123. doi: 10.1111/jir.12456

Bilmez, H. (2020). Gelisimsel yetersizligi olan cocuklarin ebeveynlerine sunulan kocluk uygulamalarinin ebeveynlerin ogretim becerileri ve cocuklarin**in** iletisim becerileri uzerindeki etkileri [The effects of coaching on teaching skills of parents and communication skills of their children with autism spectrum disorder.] (Doctoral dissertation). Anadolu University Graduate School of Social Sciences, Eskisehir, Turkey. Available from the Council of Higher Education, National Theses and Dissertation Center, Dissertation ID: 646438.

Boisvert, M., & Hall, N. (2014). The use of telehealth in early autism training for parents: a scoping review. *Smart Homecare Technology and Telehealth*, *2*, 19-27. doi: 10.2147/SHTT.S45353

Budak, F., & Korkmaz, S. (2020). COVID-19 pandemi surecine yonelik genel bir degerlendirme: Turkiye ornegi. *Sosyal Arastirmalar ve Yonetim Dergisi*, (1), 62-79. doi: 10.35375/sayod.738657

Can, H. B. (2020). Olaganustu durumlarda gelistirilen sosyal politikalarin dezavantajli gruplar uzerindeki etkisinin sosyal hizmet perspektifinden degerlendirilmesi: Covid-19 pandemisi Turkiye ornegi. *Sosyal Hizmet*, 47-63.

Canatan, K. (2020). Geleneksel ve modern ailelerde cocuk yetistirme tutumlari. *Istanbul Sabahattin Zaim Universitesi Sosyal Bilimler Dergisi*, *8*(16), 151-165.

Elo, S., & Kyngas, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing, 62*(1), 107–115. doi: 10.1111/j.1365-2648.2007.04569.x

Ertan-Kantos, Z. (2020). Sinif ogretmenlerinin uzaktan egitim ile ilgili dusunceleri. In K. Ciftyildiz (Ed.), *the 8th International Scientific Research Congress (UBAK), 2020* (pp. 67-81). Hattusa: Asos Press.

Fawcett, S. B. (1991). Social validity: a note on methodology. *Journal of Applied Behavior Analysis*, *24*(2), 235. doi: 10.1901/jaba.1991.24-235

Ferguson, J., Craig, E. A., & Dounavi, K. (2019). Telehealth as a model for providing behaviour analytic interventions to individuals with autism spectrum disorder: A systematic review. *Journal of autism and developmental disorders*, *49*(2), 582-616. doi: 10.1007/s10803-018-3724-5

Fylan, F. (2005). Semi-structured interviewing. J. Miles ve P. Gilbert (Eds.), In *A handbook of research methods for clinical and health psychology* (s. 65-78), New York: Oxford University Press.

Goplani, M., & Gupta, A. (2020). Impact of coronavirus 2019 on educational institutions in India. *The Online Journal of Distance Education and e-Learning*, *8*(3), 158. doi: 10.13140/RG.2.2.32141.36321

Griffiths, F. (2020). *The Effects of Telehealth Training on Parents of Children with Autism in Albania*. Brigham Young Ubiersity, Utah. (Master's Thesis). Available from Brigham Young University Scholars Archive, ID: 8427.

Horn BP, Barragan GN, Fore C, Bonham CA. A cost comparison of travel models and behavioural telemedicine for rural, Native American populations in New Mexico. *Journal of Telemedicine and Telecar*e, *22*(1), 47-55. doi: 10.1177/1357633X15587171

Iacono, T., Dissanayake, C., Trembath, D., Hudry, K., Erickson, S., & Spong, J. (2016). Family and practitioner perspectives on telehealth for services to young children with autism. *Stud Health Technol Inform*, *231*, 63-73. doi: 10.3233/978-1-61499-712-2-63

Kareem, S. & Bajwa, I. S. (2011). A virtual telehealth framework: Applications and technical considerations. *7th International Conference on Emerging Technologies (ICET), 2011* (pp. 1-17). Islamabad: Piscataway Press. doi: 10.1109/ICET.2011.6048445

Kizir, M. (2019). Reviewing of telehealth (distance) coaching practices for autism spectrum disorder. *Cukurova University Faculty of Education Journal*, *48*(2), 1072-1110. doi: 10.14812/cufej.569720

Knutsen, J., Wolfe, A., Burke, B. L., Hepburn, S., Lindgren, S., & Coury, D. (2016). A systematic review of telemedicine in autism spectrum disorders. *Review Journal of Autism and Developmental Disorders*, *3*(4), 330-344. doi: 10.1007/s40489-016-0086-9

Lerman, D. C., O'Brien, M. J., Neely, L., Call, N. A., Tsami, L., Schieltz, K. M., ... & Cooper-Brown, L. J. (2020). Remote coaching of caregivers via telehealth: Challenges and potential solutions. *Journal of Behavioral Education*, *29*(2), 195-221. doi: 10.1007/s10864-020-09378-2

Little, L., Dunn, W., Pope, E., & Wallisch, A. (2016). Feasibility of a telehealth coaching intervention for families of children with autism. *American Journal of Occupational Therapy*, *70*(4_ Supplement_1):7011515244p1-7011515244p1.doi: 10.5014/ajot.2016.70S1-PO1059

Longo, E., de Campos, A. C., & Schiariti, V. (2020). COVID-19 pandemic: is this a good time for implementation of home programs for children's rehabilitation in low- and middle-income countries? *Physical and Occupational Therapy in Pediatrics*, *40*(4). doi: 10.1080/01942638.2020.1759947

Machalicek, W., Lequia, J., Pinkelman, S., Knowles, C., Raulston, T., Davis, T., & Alresheed, F. (2016). Behavioral telehealth consultation with families of children with autism spectrum disorder. *Behavioral Interventions*, *31*(3), 223-250. doi: 10.1002/bin.1450

Meadan, H., Snodgrass, M. R., Meyer, L. E., Fisher, K. W., Chung, M. Y., & Halle, J. W. (2016). Internet-based parent-implemented intervention for young children with autism: A pilot study. *Journal of Early Intervention*, *38*(1), 3-23. doi: 10.1177/1053815116630327

Nickelson, D. W. (1998). Telehealth and the evolving health care system: Strategic opportunities for professional psychology. *Professional Psychology: Research and Practice*, *29*(6), 527. doi: 10.1037/0735-7028.29.6.527

Patton, M. (2002). *Qualitative Research and Evaluation Methods*. London: Sage Publications.

Phillips, V. L., Vesmarovich, S., Hauber, R., Wiggers, E., & Egner, A. (2016). Telehealth: reaching out to newly injured spinal cord patients. *Public Health Reports*, *116*(1), 94-102. doi: 10.1093/phr/116. S1.94

Reagon, K. A., & Higbee, T. S. (2009). Parent-implemented script fading to promote play-based verbal initiations in children with autism. *Journal of Applied Behavior Analysis*, *42*(3), 659-664. doi: 10.1901/jaba.2009.42-659

Rios, D., Kazemi, E., & Peterson, S. M. (2018). Best practices and considerations for effective service provision via remote technology. *Behavior Analysis: Research and Practice*, *18*(3), 277. doi: 10.1037/bar0000072

Romani, P. W., & Schieltz, K. M. (2017). Ethical considerations when delivering behavior analytic services for problem behavior via telehealth. *Behavior Analysis: Research and Practice*, *17*(4), 312-324. doi: 10.1037/bar0000074

Salomone, E., & Maurizio Arduino, G. (2017). Parental attitudes to a telehealth parent coaching intervention for autism spectrum disorder. *Journal of Telemedicine and Telecare*, *23*(3), 416-420. doi: 10.1177/1357633X16642067

Simacek, J., Elmquist, M., Dimian, A. F., & Reichle, J. (2020). Current trends in telehealth applications to deliver social communication interventions for young children with or at risk for autism spectrum disorder. *Current Developmental Disorders Reports*. Advance online publication. doi: 10.1007/s40474-020-00214-w

Tarbox, C. M., Silverman, E. A., Chastain, A. N., Little, A., Bermudez, T. L., & Tarbox, J. (2020). Taking action: 18 simple strategies for supporting children with autism during the covid-19 pandemic. *Behavior Analysis in Practice*. Advance online publication. doi: 10.1007/s40617-020-00448-5

Tekin Iftar, E. (2009). Sistematik ogretim. E. Tekin Iftar, (Ed.), In *Davranis ve ogrenme sorunu olan cocuklarin egitimi* (pp. 63-82), Eskisehir: Anadolu Universitesi Press.

Vismara, L. A., McCormick, C., Young, G. S., Nadhan, A., & Monlux, K. (2013). Preliminary findings of a telehealth approach to parent training in autism. *Journal of Autism and Developmental Disorders*, *43*(12), 2953-2969. doi: 10.1007/s10803-013-1841-8

Wainer, A. L., & Ingersoll, B. R. (2015). Increasing access to an ASD imitation intervention via a telehealth parent training program. *Journal of autism and developmental disorders*, *45*(12), 3877-3890. doi: 10.1007/s10803-014-2186-7

World Health Organization. Coronavirus disease (COVID-19) pandemic. Geneva: WHO; 2020.

Wong, O. L. (2014). Contextual barriers to the successful implementation of family-centered practice in mental health care: A Hong Kong study. *Archives of Psychiatric Nursing*, *28*(3), 212-219. doi: 10.1016/j.apnu.2014.02.001

Yang, H. W., Burke, M., Isaacs, S., Rios, K., Schraml-Block, K., Aleman-Tovar, J., ... & Swartz, R. (2020). Family perspectives toward using telehealth in early intervention. *Journal of Developmental and Physical Disabilities.* Advance online publication doi: 10.1007/s10882-020-09744-y.

Yildirim, A., & Simsek, H. (2013). *Sosyal bilimlerde nitel arastirma yontemleri*. Ankara: Seckin Yayincilik.

Yilmaz, E., Mutlu, H., & Doganay, G. (2020). *Veli algisina gore pandemi donemi uzaktan egitim surecinin niteligi.* Konya: Palet Press.

Young, H., Miyamoto, S., Ward, D., Dharmar, M., Tang-Feldman, Y., & Berglund, L. (2014). Sustained effects of a nurse coaching intervention via telehealth to improve health behavior change in diabetes. *Telemedicine and e-Health*, *20*(9), 828-834. doi: 10.1089/tmj.2013.0326.

# TEACHERS' ATTITUDES AND OPINIONS ON MATHEMATICS LESSONS CONDUCTED WITH DISTANCE EDUCATION DUE TO COVID-19 PANDEMIC

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## ABSTRACT

Distance education has become widespread since the schools are physically closed due to COVID-19 pandemic. This study concentrates on determining attitudes of teachers towards distance mathematics education and examining their views based on some variables. Participants of the study consists of 189 teachers who voluntarily participated to the study, are selected via maximum variation sampling method, are working in primary, secondary and high school levels in provinces of Mugla and Kocaeli, and who teach Mathematics via distance education platforms. This study relies on mixed-method research where data collection was done with distance education attitude scale and view form, both prepared and applied online. Data from distance education attitude scale was analyzed quantitatively and data from view form was analyzed with descriptive analysis method. The result of the study demonstrated that attitudes of teachers towards distance mathematics education were indecisive but in negative direction. While attitudes of teachers towards distance mathematics education were found to differ significantly based on some variables like age, occupational experience, type of school, level of education and foreknowledge towards distance education, they did not differ significantly for gender and duration of internet use. Moreover, teacher also remarked positively towards sustainability and repetitive nature of the courses while they commented negatively on technical problems and structure of some courses may not fit in distance education.

**Keywords:** COVID-19, mathematics, attitude, distance education.

## INTRODUCTION

Due to COVID-19 pandemic where the world is facing a big crisis, life has almost stopped except from some basic services. Education is one of the most important of all. Almost %90 of students across the world has been deeply affected by this situation (UNESCO, 2020).

Although schools were physically closed in many countries including Turkey for making health of students and all humanity safe during COVID-19 pandemic, various practices have been made to make learning sustainable in our country. The core of these practices mainly consists of distance learning. As known, distance learning is an education model where students and teachers carry out teaching and learning relations in different times and places with communication technologies and e-mails (Isman, 2005). Distance education has different forms in education systems. Along with beginning of internet use in distance education, the concepts of e-learning, internet based education, mobile learning, web-based education have been started to use (Yildiz, 2011). Distance education might be carried out in three ways depending on the need; asynchronous, synchronous and mixed. Asynchronous learning environments are flexible environments where course content is prepared beforehand, participants can communicate through online environments like e-boards, e-mail or forum and they can access to the content as many times as they want even if they are not in the same system (Hrastinski, 2008). Synchronous learning environments, on the other hand, are real time learning environments where students and teachers can communicate aurally or written even if they are in different physical places (Patton,2008). Mixed model includes both modals together in the same modal.

When causes which makes distance education compulsory are examined, a number of factors like equality in opportunity, decrease in cost, providing education to individuals regardless of age and based on their needs, accessing more learners than conventional education does, making communication between individuals and maintaining cultural unity (Cetin, 2010). But, these days showed us that we should also count causes pandemics.

Having worked so hard during this pandemic to make education sustainable, Turkey ensures distance education in primary and secondary schools in two basic ways: (i) (EBA) Educational Information Network which was already founded before with a well-established infrastructure as well as recently updated rich contents, (ii) TV channels (TRT-EBATV) which broadcast video courses according to different grade levels. Moreover, teachers also contribute this process by communicating with their students via teleconference courses and questions, as well as sharing resources through the system and even following students' assignment from the system. Distance education in our country during the pandemic is being carried out with mixed modal approach.

There have been many researches on distance education so far in the literature. For instance, when attitudes of teachers towards distance education is considered; there have been many studies which indicates positive attitudes (Agir, Gur and Okcu, 2008; Celen, Celik and Seferoglu, 2013; Yilmaz and Guven, 2015; Yenilmez, Balbag and Turgut, 2017), indecisive attitudes (Ates and Altun, 2008) and negative attitudes (Yilmaz and Guven, 2015). Apart from attitudes, there have also been some studies on the effect of distance education on success. While some of them claims that distance education in mathematicss affect success more than conventional education (Hwang, Vu, and Chen; 2012; Lin, 2009; Ozyurt, 2012; Tsuei, 2012; Yorganci, 2013), there have also been some others which put forward that conventional education is more effective than distance education (Li, Uvah, Amin and Hemasinha, 2009; Paden, 2006). Besides, Javed (2008) argues that there is no difference between distance and conventional education. When the studies conducted in recent years are examined, it is seen that the studies comparing distance education and traditional education have decreased (Aktas, 2013). Comparison studies have been replaced by determining which types of distance education activities are effective in increasing success, and what perceptions and opinions of students are about distance education. Studies conducted in distance education activities include visual, sound and communication problems, limited interaction, body language used by teachers and time allocated for lessons, etc. It reveals that factors affect participants' perceptions of distance education (Koppelman & Vranken, 2008; Marsh, Mitchell & Adamczyk, 2010). In addition, it is observed that concurrent distance education activities are insufficient to meet the expectations of the participants for education (Delaney, Jacob, Iedema, Winters & Barton, 2004). In addition, it has been stated that verbal lessons can be taught effectively with distance education, but some technical lessons that require practice cannot be given in a healthy way with distance education, so it would be more beneficial to use distance education as a teaching method that supports traditional education (Horzum, 2003; Alakoc, 2001).

As seen above, there have been many studies on distance education but what matters here is that all studies so far have taken distance education as an alternative or a supplementary method. Yet, it has been seen during this pandemic that distance education is not an alternative, it has become compulsory. For this reason, every educator and learner with or without distance education experience had to teach or take lessons by distance education method due to the pandemic process. Educational institutions and educators operating in this field have sought how to conduct distance education courses and how to use online tools in this process (Karip, 2020). In this context, with regard to distance education, it can be stated that the world will no longer be the same (Durak, Cankaya, & Izmirli, 2020). In this process, it is seen that most of the trainers have never used distance education tools before (Cetinkaya Aydin, 2020). Considering that these trainers have limited knowledge and skills in teaching distance education and preparing distance education material, it cannot be said that this process will continue completely. In case of any extension of pandemic and going on distance education in later periods, views of teachers have gained importance in determining what to do to make distance education practices better. With this in mind, this study aims at determining attitudes of teachers towards distance mathematicss education and examining their views based on some variables. In line with this aim, the following problems were posed: attitudes of teachers towards Mathematics lessons in distance education, gender, age, occupational experience, type of school, level of education, duration of internet use and foreknowledge on distance education. Accordingly, the following questions were addressed:

1. How attitudes do teachers have towards mathematics lessons in distance education?
2. How do teachers' attitudes change according to the variables of gender, age / professional experience, school where they work, education level, internet usage time and prior knowledge about distance education?
3. What are the views of teachers towards mathematics lessons in distance education?

## METHOD

The mixed method provides a much better understanding of the research problem by using quantitative and qualitative approaches together (Cresswell & Plano Clark, 2007). In this study, one of the Cresswell (2003) designs of the mixed method, "sequential explanatory design" was used. In this design, qualitative data are often collected after quantitative data are collected. The priority is on quantitative data, qualitative data are obtained to support quantitative data. The data are analyzed separately and combined in the interpretation and discussion section (Gokcek, 2019). While qualitative method of research, makes data analysis more detailed via observation, interview etc., the data collected with the quantitative method approach helps to reach more participants (Greene et al., 1989). In the study, quantitative data obtained from applying a scale to the study group was supported by qualitative data obtained from a semi-structured interview form with a group of participants.

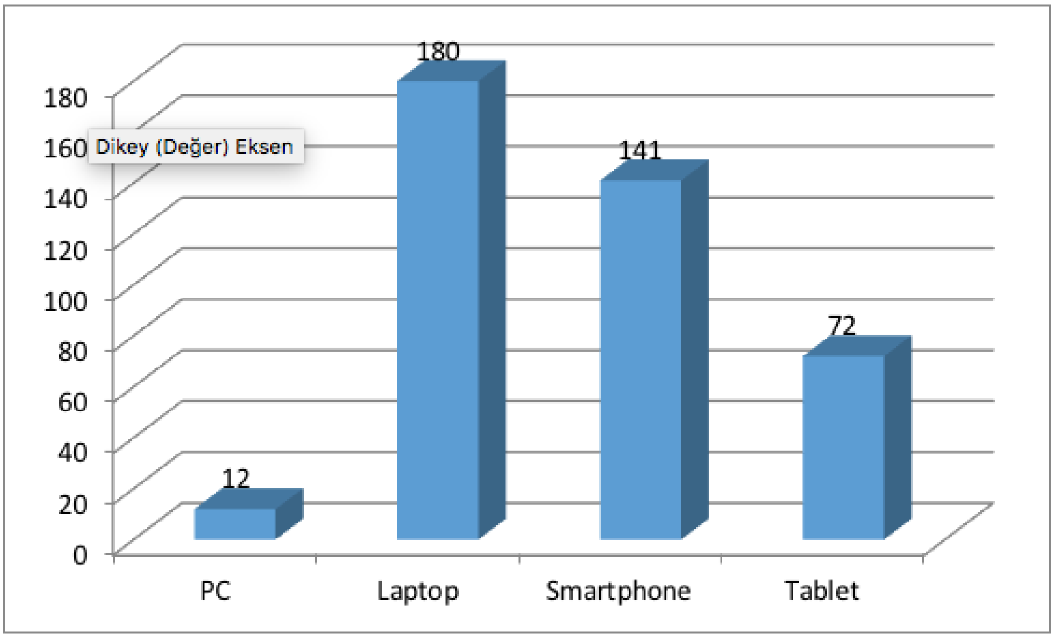
### Participants

Teachers who attend mathematics lessons and teach at least once distance education and mathematics lessons are determined as the universe of the study. Since it would not be possible to reach the entire universe and the sampling method of the mixed research method, the "appropriate sampling" method was preferred. In the appropriate sampling, a sample that is both easily accessible and willing to participate in the study is selected (Gokcek, 2019). The study group of the research consists of 189 volunteer teachers working in primary, secondary and high schools in Mugla and Kocaeli provinces determined by the maximum variation sampling method in 2019-2020 academic years, and teaching mathematics with distance education. The reason for choosing these two provinces is that researchers work in these provinces and have easier access to teachers working in these provinces. Demographic information of the teachers participating in the study is given in Table 1.

**Table 1.** Demographic info of participant teachers

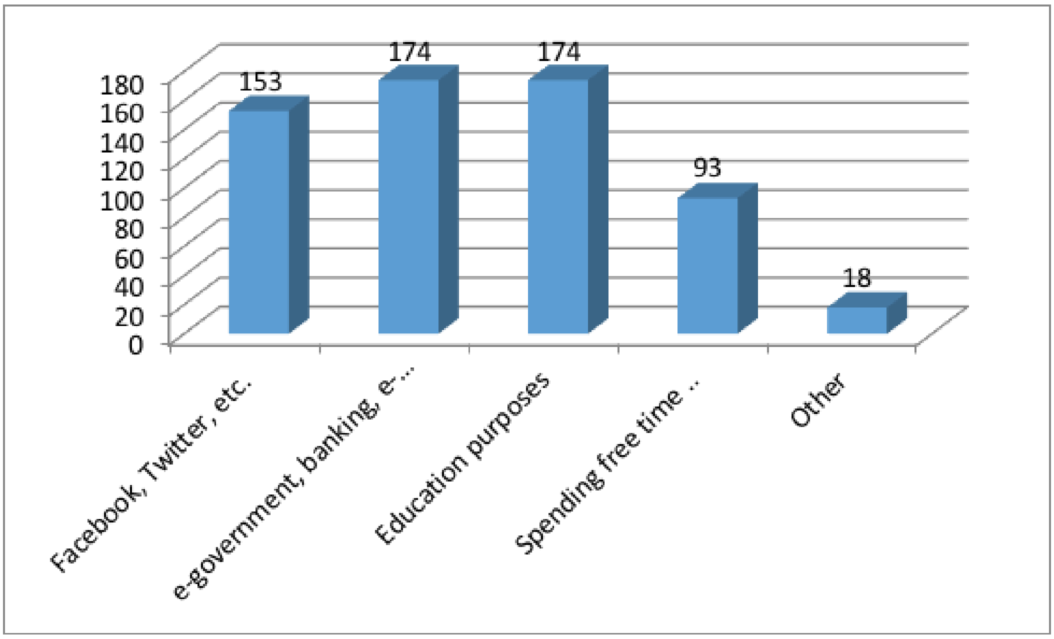
| Variable | Category | f | % |
|---|---|---|---|
| Gender | Female | 138 | 73,0 |
| | Male | 51 | 27,0 |
| Age | 20 - 30 years | 48 | 25,4 |
| | 31 - 40 years | 126 | 66,7 |
| | 41 - 50 years | 12 | 6,3 |
| | 51 - 60 years | 3 | 1,6 |
| Experience | 1 - 5 years | 15 | 7,9 |
| | 6 - 10 years | 72 | 38,1 |
| | 11 - 15 years | 72 | 38,1 |
| | 16 - 20 years | 24 | 12,7 |
| | 21 years and above | 6 | 3,2 |
| School Type | Primary | 55 | 26,6 |
| | Secondary | 111 | 58,7 |
| | High-School | 24 | 12,7 |
| Education Level | Undergraduate | 165 | 87,3 |
| | Graduate | 24 | 12,7 |
| Weekly Use of Internet | 1- 2 days | 18 | 9,5 |
| | 3- 4 days | 24 | 12,7 |
| | 5 -6 days | 30 | 15,9 |
| | Everyday | 117 | 61,9 |
| Foreknowledge on DE | Less knowledge on DE | 30 | 15,9 |
| | Sufficient knowledge on DE | 130 | 65,1 |
| | Already lectured in DE | 36 | 19,1 |
| Total | | 189 | 100,0 |

According to Table 1, the majority of teachers included in the study were female (73%) and the age range was between 31-40. Approximately 80% of the teachers participating in the research consist of teacher groups with 6 to 10 years and 11 to 15 years of professional experience. In terms of the school type of teachers; it is seen that the secondary school teachers are about 60% and the primary school teachers are 30%. It was found that a significant number of teachers use the internet every day of a week and they have sufficient information about distance education. In addition, the technological tools they use and their purposes of using the internet are shown in Graph 1 and Graph 2 below.




**Graph 1.** Technological Tools Used

When Graph 1 is examined, it is seen that mathematics teachers use laptop computers mostly, followed by smartphone and tablet respectively. In Graph 2, which aims to use the Internet, it is seen that teachers generally use it for education and e-government, banking, e-commerce, etc. purposes.




**Graph 2.** Purpose of Internet Use

## Data Collection Tools and Data Analysis

In the study, distance education attitude scale and opinion form were used as data collection tools. The data were collected online on the website www.surveey.com between 20 March and 20 June 2020. The Distance Education Attitude Scale developed by Agir, Gur and Okcu (2008) was used to measure the attitudes of mathematics teachers towards distance education. After the pilot study, it was observed that the items were grouped under 6 factors. These factors were reduced to 2 factors: "advantages of distance education" consisting of 14 positive items and "limitations of distance education" consisting of 7 negative items by consulting experts (Agir, Gur and Okcu, 2008). In this study, while calculating the attitude score, it was evaluated as a single dimension and analyzed in line with the suggestions of the researchers. Items of the scale were adapted to apply them to mathematics lessons and teachers and then validity and reliability analyzes were made. The construct validity of the scale was provided by doing exploratory factor analysis. Cronbach Alpha value of the adapted measurement tool was calculated as 0.801.

Items on the scale are rated 1, 2, 3, 4, 5, from strongly disagree to strongly agree. The lowest score that can be obtained from the scale is 21, and the highest score is 105. The score obtained from the scale shows the attitude towards distance education. It can be inferred that the attitude towards distance education is negative as the mean scores decrease. The score range coefficient required for the evaluation of arithmetic averages is determined as 0.80 (Tekin, 1996). The ranges to be used in evaluating the attitude scores of the participants are shown in Table 2. In negative items, reverse scoring was made.

The mean scores of the items in the scale were calculated and shown, t test and Anova (one-way analysis of variance) were applied to determine the differences of the attitudes of mathematicss teachers towards distance education according to demographic variables, and Scheffe test was performed to determine the difference. It was examined whether the study group showed normal distribution, as a result of the analysis the following scores were noted skewness = -.362; kurtosis (=. 543). Also, according to the results of Kolmogorov - Smirnov test (.184), it was observed that the attitude scores showed normal distribution. It was decided to apply parametric tests after meeting the basic assumptions.

**Table 2.** The Levels Used in Commenting Attitude Scores of Teachers towards Distance Education

| Level | Score | Limits (Mean) |
|---|---|---|
| Strongly Agree | 5 | 4.20 - 5.00 |
| Agree | 4 | 3.40 - 4.19 |
| Neutral | 3 | 2.60 - 3.39 |
| Disagree | 2 | 1.80 - 2.59 |
| Strongly Disagree+++ | 1 | 1.00 – 1.79 |

In the opinion form, three open-ended questions developed to determine the opinions about the mathematics lessons conducted by distance education were asked to the teachers:

1. What are your views on the benefits of distance education in mathematics lessons?
2. What are the limitations and problems encountered in the implementation of distance education in mathematics lessons?
3. Will distance education be effective in increasing academic achievement and attitude towards the course in mathematics lessons?

In this section, which was analyzed in a qualitative dimension, 44 teachers from 189 participants were asked open-ended questions and their responses were examined with descriptive analysis technique. As it is known, content analysis was used to analyze the data obtained in this study. The purpose of content analysis is to gather similar data within the framework of certain concepts and themes as a result of in-depth analysis of the data and to interpret them in a way that the reader can understand (Cepni, 2018). In this direction, in the study, the opinions of the teachers were tried to be revealed through direct quotations, by sticking to the original form of the data obtained from the teachers.

While applying the interview questions, it was stated that the data would not be used for any other purpose other than research, and the participants were made to feel comfortable and in this way, reliability was tried to be increased. In the research, each of the teachers was first coded as T1, T2, T3… to keep the information confidential. The data obtained from the interviews were primarily put into writing. Parts not related to the interview questions have been removed. Each interview question was handled as a category and codes were collected under these categories. For example; For the benefits category of distance education, codes such as continuity and classroom domination were determined in line with teachers' opinions. The data were first coded by the first researcher, then the codings were checked by other researchers. For codes where no consensus was reached, a joint decision was made by re-reading the data. The data obtained were repeatedly read by the researchers and a full consensus was attempted while coding. The internal validity of the research was ensured by looking at the significance and consistency of the data. In all processes of the research, expert opinions were asked, they were asked to give feedback with a critical perspective, and the findings obtained in this way were presented under categories.

## FINDINGS

This study focuses on determining attitudes of teachers towards distance mathematics education and examining their views based on some variables. The findings obtained from attitude scale and view forms are presented below.

### Findings obtained from Attitude Scale towards Distance Education

Mean scores of items in attitude scale applied to teachers of mathematics conducting their course via distance education are given below.

**Table 3.** Items and Mean Scores of Attitude Scale towards Distance Education

| No | Items | Mean |
|---|---|---|
| 1. | Distance education is more effective than traditional education in mathematics lessons. | 1,84 |
| 2. | Learning in distance education is more enjoyable than traditional education in mathematics lessons. | 2,03 |
| 3. | Better results are gained from distance education applications in mathematics lessons.. | 2,37 |
| 4. | Mathematics lessons in distance education should be more commonly used. | 2,46 |
| 5. | Time is used more effectively in mathematics lessons in distance education. | 2,41 |
| 6. | Mathematics lessons in distance education make learning more permanent. | 2,29 |
| 7. | Conducting mathematics lessons in distance education improves self-assessment skills. | 2,67 |
| 8. | Getting scores of assessment and evaluation immediately in mathematics lessons in distance education increases motivation of students. | 3,08 |
| 9. | Mathematics lessons in distance education provide flexibility of rehearsing as much time as one wants. | 3,63 |
| 10. | Being not limited to time and place provides sustainability of education in mathematics lessons in distance education. | 3,54 |
| 11. | I like taking mathematics lessons in distance education. | 2,44 |
| 12. | Mathematics lessons in distance education are more effective in solving problems caused in applications of traditional education. | 2,27 |
| 13. | Everyone can take education fitting to their own level of mathematics lessons in distance education. | 3,10 |
| 14. | Mathematics lessons in distance education supplies effective learning by means of audio, visual designs and technology. | 3,30 |
| 15. | Tracking success processes of individuals is easier in mathematics lessons in distance education. | 2,84 |
| 16. | Face to face education is needed to give mathematics education in the best way. | 4,22 |
| 17. | Traditional education is more useful than distance education in mathematics lessons. | 3,95 |
| 18. | Mathematics lessons in distance education causes problems in terms of implementation. | 3,83 |
| 19. | Managing educational environment cannot be done in a healthy way in mathematics lessons in distance education. | 3,92 |
| 20. | Mathematics lessons in distance education cannot be implemented in a healthy way in our country. | 3,32 |
| 21. | Student motivation is low in distance education in mathematics lessons as there is no face to face education. | 3,84 |
| | Total | 2,74 |

Table 3 demonstrates that the highest mean score of the items in attitude scale towards distance education belongs to "Face to face education is needed to give mathematics education in the best way." (=4,22), and the lowest mean score belongs to "Distance education is more effective than traditional education in mathematics lessons." ( =1,84).

The mean score of the item 16 was found between 4.20-5.00, and the mean score of the items 9, 10, 17, 18, 19 and 21 was found between 3.40-4.19. This show that teachers strongly agree with item 16 and they agree with other items. When items were examined carefully, it can be seen that teachers strongly agree with the idea that education should be conducted face-to-face to make it in the best way. They also agree with the idea that distance education is useful in terms of rehearsing as many time as one wishes, not being limited with time and place, and sustainability of education. Moreover, it was found that teacher show negative attitude towards distance education as they remarked management of learning environment cannot be done in a healthy way, learning won't be permanent, there would be problems with implementation and student motivation would be low.

The mean score of the items 7, 8, 14, 15 and 20 was found between 2.60-3.3.39. This indicates that teachers are neutral on these items.

According to the findings in table 3, the mean score of the items 1, 2, 3, 4, 5, 6, 11,12 was found between 1.80-2.59. When some of these items were examined in a detailed way, it was found that teachers don't agree with the items "Learning in distance education is more enjoyable than traditional education in mathematics lessons.", "Better results are gained from distance education applications in mathematics lessons.", and "Mathematics lessons in distance education should be more commonly used."

Table 3 reveals that mean attitude scores of mathematics teachers towards distance education are between ( =54.8, =2.74) and their attitudes seem neutral in favor for negative. Moreover, a One-way variance analysis (ANOVA) and independent t-tests were conducted to find out whether attitude scores of mathematics teachers towards distance education differ in terms of variables like age, occupational experience, type of school, level of education and foreknowledge towards distance education, gender and duration of internet use. Findings are presented in Table 4.

**Table 4.** One-way variance analysis (ANOVA) and independent t-tests analysis results of attitude scores of mathematics teachers towards distance education in terms of various variables

| School Types | X | ss | F | p |
|---|---|---|---|---|
| Primary | 2,5423 | ,44951 | | |
| Secondary | 2,8404 | ,57834 | 5,443 | ,005* |
| High School | 2,7202 | ,58343 | | |
| Age | | ss | F | p |
| Between 20 - 30 | 2,9167 | ,56159 | | |
| Between 31 - 40 | 2,7166 | ,54290 | 4,149 | ,007* |
| Between 41 - 50 | 2,5238 | ,53809 | | |
| 51 and over | 2,3333 | ,54028 | | |
| Gender | X | ss | T | p |
| Female | 2,7277 | ,52917 | -,495 | ,601 |
| Male | 2,7731 | ,63450 | | |
| Education Level | X | ss | t | p |
| Undergraduate | 2,6606 | ,53095 | -6,508 | ,000* |
| Graduate | 3,2857 | ,42476 | | |
| Experience | X | ss | F | p |

| | | | | |
|---|---|---|---|---|
| 1 - 5 years | 2,6571 | ,51921 | | |
| 6 - 10 years | 2,8968 | ,46835 | | |
| 11 - 15 years | 2,7242 | ,64022 | 4,311 | ,002* |
| 16 - 20 years | 2,5060 | ,43910 | | |
| 21 years and above | 2,1905 | ,36515 | | |
| Weekly Usage of Internet | X | ss | F | p |
| 1- 2 days | 2,9841 | ,60851 | | |
| 3- 4 days | 2,7857 | ,52616 | 2,638 | ,051 |
| 5 -6 days | 2,8714 | ,46810 | | |
| Everyday | 2,6593 | ,56592 | | |
| Foreknowledge on DE | X | ss | F | p |
| Less knowledge on DE | 2,6678 | ,56014 | | |
| Sufficient knowledge on DE | 2,8238 | ,71282 | 3,245 | ,041* |
| Already lectured in DE | 2,9167 | ,31982 | | |

*$*p<0,05$*

It was found that attitudes of teachers towards distance mathematics education differ significantly based on school type. Related Scheffe test was conducted and it showed that the related difference is between teachers whose school type is secondary and primary in favor of secondary school [F=5,443, p=.005]. Moreover, the highest mean attitude score is secondary school while the lowest one is primary school.

The attitudes of mathematics teachers towards distance education were found to differ significantly based on age (p=0,05). The result of Scheffe test demonstrated that the difference is between teachers with the age group of 20-30 and 50 and above in favor of 20-30 age group [F=4,149, p=.007]. It was found that the attitudes of mathematicss teachers towards distance education decreases as age level increases.

Table 4 indicates that according to t-test attitudes of teachers towards distance mathematics education differ significantly based on level education in favor of those with graduate level [t=--6.508, p=.000].

In order to figure out whether attitudes of mathematics teachers towards distance mathematics education differ significantly based on occupational experience, a one way analysis of variance was conducted [F=4,311, p=.002]. Scheffe test revealed that the difference is between teachers with occupational experience of 6-10 years and 21 years and above in favor of 6-10 experience level.

As a result of the variance analysis to find out whether attitudes of mathematics teachers differ in terms of foreknowledge of distance education, it was found that attitudes differ significantly. Scheffe test indicates that the difference is between teachers with low level of foreknowledge and high level of foreknowledge towards distance education [F=3,245, p=.041].

The findings in Table 4 demonstrates that attitudes of mathematics teachers towards distance education does not differ in terms of gender [t=-.495, p=.601] and weekly use of internet [F=2,638, p=.051].

## Findings obtained from View Forms

The codes derived from the first question in view form "What are your views on the benefits of distance education in mathematics lessons?" and some quotations of teachers are presented in the following table.

**Table 5.** View towards Benefit of Distance Education of Mathematics Lessons

| Codes | Benefit of Distance Education | f |
|---|---|---|
| Sustainability | "Providing opportunity to carry out courses in any condition" | 13 |
| Classroom Management | "I find it useful as it prevents students making noise and distraction of attention." | 4 |
| Use of Materials | "Distance education made it better in using visual materials." | 11 |
| Being able to Rehearse | "Students can rehearse as many times as they want regardless of time due to recording option" | 15 |

Table 5 indicates that teachers remarked that distance education is useful in terms of sustainability, classroom management, use of material and being able to rehearse. Many of the teachers commented that education could go on since distance education makes it possible to carry out classes in any condition.

The codes derived from the second question in view form "What are the limitations and problems encountered in the implementation of distance education in mathematics lessons?" and some quotations of teachers are presented in Table 6.

**Table 6.** Views on limitations and problems encountered in the implementation of distance education in mathematics lessons

| Codes | Limitations and Problems of Distance Education | f |
|---|---|---|
| Technical problems | "Problems while using live course applications on EBA, except from internet connection.<br>"Low speed internet connection, systematic problems" | 21 |
| Teacher Proficiency of Technology | "Teachers cannot convey concepts of mathematics properly if they are not competent in use of technology."<br>"We were pushed in to the system without getting any training, teachers with no familiarity of tech-teaching are having great problems" | 7 |
| Working Discipline | "It is problematic since we cannot see how students follow courses." | |
| Lack of Interaction | "Not being able to keep track of students like how students follow courses and do they take notes or not?"<br>"Eye contact is missing, gestures and mimicry don't contribute to teaching."<br>"Lack of interaction during preparations of learning and not being able to maintain group interaction"<br>"We cannot make face-to-face interaction with kids during courses" | 8<br>14 |
| Learning Environment | "…, the effect of external sounds to live courses"<br>"It is getting harder to keep a student, who is not interested in mathematics education, in front of the screen" | 6 |
| Structure of the Course | "It is really hard to write mathematicsal formulas and terms in most of computer applications. Drawing graphics, writing solution of problems is also difficult."<br>"As mathematics is already a course which people have predijuce, I don't think it can be understood well enough via distance education." | 17 |

In Table 6, teachers remarked that mathematics education in distance education has some limitations and problems like technical problems, teacher skills, working discipline, and limitations in interaction, learning environment and structure of courses. Within these expressions technical problems and not being compatible with structure of the course have been commented by many of the teachers.

The codes derived from the third question in view form "Will distance education be effective in increasing academic achievement and attitude towards the course in mathematics lessons?" and some quotations of teachers are presented in Table 7.

**Table 7.** Views on The effect of Distance Education on Academic Success and Attitude

| Codes | The Effect of Distance Education on Academic Success and Attitude | f |
|---|---|---|
| Positive | "It will definitely be effective. Students who motivate themselves at school would also become successful in distance education." "It will certainly be effective in motivation, activity and, testing and evaluation parts of the course. Using educational technologies while giving courses facilitates reaching course objectives and gains faster." | 10 |
| Partially Positive | "I don't think distance education increases academic achievement in mathematics lessons. It might help partially but generally speaking it is more limited compared to verbal courses." "It increases if it is used additional to regular education but distance education solely can't be effective in increasing academic success." "It might increase attitude to course if distance education supplements active learning period. It might increase academic success as teachers have data which they can use in the analysis of the parts they find difficult to deal with." | 15 |
| Negative | "No. As mathematics is a lesson based on practice, I think traditional education is the most effective method in increasing academic success and attitude." "No, it cannot be. Mathematics should be given in one-to-one mode. Adaptation to the lesson is already a problem, It is a biased subject." "To me, union of place and face-to-face education is a must for academic success in mathematics." | 19 |

Table 7 reveals that 10 of teachers commented positively, 15 of them commented partially positive and 19 of them commented negatively on mathematics lessons in distance education towards increasing academic success and attitude.

## DISCUSSIONS AND CONCLUSION

The results of the study indicating views and attitudes of teachers towards mathematics lessons in distance education during Covid 19 pandemic were presented and discussed along with the addressed research questions. Firstly, attitudes of teachers towards courses conducted via distance education were taken into consideration. When findings obtained from attitude scale were examined wholly, they are in a neutral level. Ates and Altun (2008) also claimed that attitudes of teachers are neutral. On the contrary many there have been many studies indicating positive attitudes of teachers towards distance education and they are willing to attend distance learning activities (Agir, Gur and Okcu, 2008; Celen, Celik and Seferoglu, 2013; Yenilmez, Balbag and Turgut, 2017). It might be thought that these differences in view of teachers towards distance education might stem from course contents and the way the courses are given.

When the findings obtained from attitude scale of distance education were examined, it was understood that most of teachers agree on the items of "being not limited to time and place", and "being able to listen to the courses anytime", "being able to rehearse the topics they mostly have trouble with". According to findings of view form, they also remarked that distance education mathematics lessons have some benefits like sustainability, classroom management, use of materials and rehearsing chances. Even teachers who don't use any materials in conventional education expressed that distance education presents alternative learning methods with visual and digital materials and these might be helpful in subjects like geometry. These findings support the results of attitude scale. There have been a number of studies in the literature stressing out that some features including being independent from time and place, and giving more opportunities for rehearsing are the most positive features of distance education (Aggarwal, 1999; Belcheir and Cucek, 2002; Sharples, Taylor and Vavoula, 2005; Eygu and Karaman, 2013; Ozgol, Sarikaya and Ozturk, 2017).

One of the results derived from the scale and the view form is that both teachers and learners have some sort of concerns like not getting motivated and low level of motivation due to lack of face to face interaction. A great deal of studied documented that low interaction between teacher-learner, learner-teacher due to lack of interaction causes major problems in distance education (Galusha, 1997; Wood, 1998, Yazici, Altas and Demiray, 2001; Usun, 2006; Falowo, 2007; Li, 2009; Tryon and Bishop, 2009; Isman, 2011).

Birisci (2013) argues that learners being educated with distance education have been facing lack of motivation in distance education activities. As there is no teacher-learner interaction in asynchronous courses where there is no face to face communication, reactions, mimicries or body language movements are not seen. Not being able to ask questions face to face is another limitation. Mathematics lessons have a conceptual structure and these concepts can also be taught in face to face fashion. Thus this prevents these courses to be conducted effectively.

Most of the teachers participating in the research stated that they have sufficient knowledge about distance education or have taught about distance education before. In addition, it has been observed that they use the internet frequently and generally for educational purposes, and they have the necessary technological tools personally. Teachers' limited competencies and skills to provide distance education, and significant differences between their competencies in terms of using and accessing digital tools may cause difficulties in carrying out this process effectively. Teachers who can reach all students through communication channels and have sufficient technological skills may be insufficient for some courses, grade levels, age groups and students in distance education. The teachers stated that primary school students in terms of grade level and age group felt deficient in distance education in lessons that include applications such as mathematics and science.

Teachers commented in view form that technological problems affect distance education process; therefore distance education can't improve academic success and attitude towards mathematics lesson. There have been many studies in the literature stress out technical problems like internet connection and power cut (Bonk, 2001; Goktas and Kayri, 2005; Turkey Informatics Council, 2002; Koppelman and Vranken, 2008; Marsh, Mitchell and Adamczyk, 2010; Isman, 2011; Koparan and Yilmaz, 2020). Koc (2017), on the other hand, student success in distance education should be fostered by increasing attendance via appealing learning activities and discussion forums. There have been many studies indicating that distance education is effective in increasing student success (Hwang and Chang, 2011; Martin and Ertzberger, 2013; Song, 2014; Yorganci, 2014; Koparan and Yilmaz, 2020). Thus, teachers should be guided by examining and having an opinion on the methods used in activities which increases student success.

Another research problem of the study is to examine attitude of mathematics teachers towards distance education in terms of variables like age, occupational experience, type of school, level of education and foreknowledge towards distance education, gender and duration of internet use. Findings indicate that attitude of teachers towards distance education did not significantly differ based on variables of gender and duration of internet use. This is in line with the findings of Agir et al. (2008). Ates and Altun (2008), Yenilmez and et al (2017) stated that gender has an effect on attitude. Once again Yenilmez and et al (2017) concluded that duration of internet use has no effect on attitudes of teachers towards distance education. Thus, it might be inferred that gender is not a determinant factor on attitudes.

Significant differences were found between attitudes of teachers towards distance education and age, occupational experience, type of school, level of education and foreknowledge towards distance education. In terms of age variable, it can be said that 20-30 age group has a more positive attitude and mean attitude score decreases as age level increases. Tucker (2011) claims that there is no significant difference between attitudes towards education and age. From the perspective of occupational experience, teachers with 6-10 years of experience have more positive attitudes towards distance education. This finding is coherent with age variable. There have been many studies in the literature claiming that there are significant differences based on occupational experience in belief and attitude studies towards distance education. Findings derived from studies in the literature support the findings of this study.

In terms of school type, the difference was found between teachers in secondary school and primary school. Agir, Gur and Okcu (2008), in their study examining attitudes of primary school teachers, found that attitudes of teachers did not significantly differ in terms of schools they work.

As for level of education, attitudes of teachers toward distance education seem to differ significantly in favor of teacher with graduate degrees. Moreover, based on the variable of foreknowledge towards distance education significant differences were found between teachers who have given distance education before and those who have low and sufficient level of foreknowledge towards distance education. Studies have given support that having foreknowledge towards distance education affects attitudes towards distance education (Agir, Gur and Okcu, 2008; Ates and Altun, 2008; Yenilmez, Balbag and Turgut, 2017). This is in line with the findings of this study.

In conclusion, it is understood that attitudes and views of teachers towards mathematics lessons which have been conducted via distance education are inconclusive and indecisive. Teachers who don't want to be a part of distance education might decrease motivations of teachers and learners who have adopted and possibly adopt this structure with their negative comments during this distance education period where it is no longer an alternative but mandatory. Preparations should be done before distance education process and views, wishes and suggestions of teachers should be kept in mind before taking action. Problems of content, use of material and assessment and evaluation methods should be fixed. Assessment and evaluation, even though it was not used effectively in this process, is a major problem in distance education. Distance education and following exams conducted in our universities show it clearly how we lack in assessment and evaluation. However, considering that the distance education process implemented in this process is not a planned activity and is an urgent and mandatory process, these deficiencies are expected.

There have been many problems related with the use of distance education in mathematics education. Although the process is pretty new, results of this study demonstrates that experimental studies focusing on how distance education methods can be used in a more dynamic way should be conducted and the number of these studies should be increased to contribute to solution of the problem. Parallelly, the process might be supported with implementations in diverse levels and courses by taking into account of both teachers' and learners' needs and wishes. Moreover, attitude scale of distance education unique to mathematics lesson might be developed with inclusion of assessment and evaluation experts to the study. It is important to establish a solid infrastructure for distance education support services in our schools and to provide continuous support to students. In addition, quantitative and qualitative studies can be carried out by taking the opinions of teachers, students, and distance education process managers in order to provide in-service training to educators on distance education and to evaluate emergency distance education in education systems during the pandemic period.

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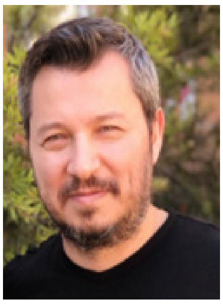

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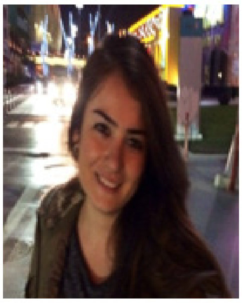

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## REFERENCES

Aggarwal, A. K. (Ed.). (1999). *Web-Based Learning and Teaching Technologies: Opportunities and Challenges*, IGI Global.

Agir, F. (2007). Ozel Okullarda ve Devlet Okullarinda Calisan Ilkogretim Ogretmenlerinin Uzaktan Egitime Karsi Tutumlarinin Belirlenmesi [Determinig the Teachers' Attitudes Towards Distance Education In Public Primary School And Private Primary School] (Master's dissertation) Balikesir University Graduate School of Science Sciences, Balikesir, Turkey.Balikesir. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 177901.

Agir, F., Gur, H. & Okcu, A. (2008). Uzaktan egitime karsi tutum olcegi gelistirilmesine yonelik gecerlik ve guvenirlik calismasi [Development Of The Attitude Scale Toward Distance Learning: Reliability And Validity]. *e-Journal of New World Sciences Academy*, 3(2), 128-139.

Alakoc, Z. (2001). Genel olarak uzaktan ogretim ve konuya ogretim uyelerinin bakis acilari. [Distance education in general and faculty's perspectives on the subject]*Sakarya Universitesi Egitim Fakultesi Dergisi*, 3, 403-413.

Ates, A., & Altun, E. (2008). Bilgisayar oğretmeni adaylarinin uzaktan eğitime yonelik tutumlarinin cesitli degiskenler acisindan incelenmesi [Investigating Preservice Computer Teachers' Attitudes Towards Distance Learning Regarding Various Variables]. *Gazi Universitesi Egitim Fakultesi Dergisi*, 28(3), 125-145.

Baek, Y., Zhang, H. & Yun, S. (2017). Teachers' attitudes toward mobile learning in Korea. *The Turkish Online Journal of Educational Technology*, 16 (1), 154- 163.

Bahcesehir University Report,(2020), Retrieved April 20, 2020 from https://www.cumhuriyet.com.tr/haber/uzaktan-egitim-raporu-aciklandi-uzaktan-olmuyor 1739116.

Belcheir, M. J. & Cucek, M. (2002). Faculty Perceptions of Teaching Distance Education Courses. Research Report 2002. (ERIC Document Reproduction Service No: ED 480 925).

Birisci, S. (2013). Video konferans tabanli uzaktan egitime iliskin ogrenci tutumlari ve gorusleri. [Attitudes and Opinions of Students on Video Conference Based Distance Education] Journal of Instructional Technologies & Teacher Education, 1(2), 24-40.

Bonk, C. (2001). Online teaching in an online world. http://www.publicationshare.com/docs/faculty_survey_report.pdf.

Creswell, J. W. (2003). Research design: Qualitative, quantitative, and mixed methods approaches (2nd ed.). Thousand Oaks, CA: Sage.

Creswell, J., & Plano Clark, V. L. (2007). Understanding mixed methods research. In J. Creswell (Ed.), *Designing and conducting mixed methods research* (pp. 1-19). Thousand Oaks, CA: Sage.

Celen, F.K., Celik, A., & Seferoğlu, S.S. (2013). Analysis of teachers' approaches to distance education. *Procedia–Social and Behavioral Sciences*, 83, 388-392.

Cepni, S. (2018). *Arastirma ve proje calismalarina giris*. (8.Baski).[ Introduction to research and project studies. (8th Edt.)] Trabzon: Celepler Matbaacilik.

Cetin, O. (2010). Fen ve Teknoloji Dersinde "Coklu Ortam Tasarim Modeli"ne Gore Hazirlanmis Web Tabanli Ogretim Iceriginin Ogrenci Basari ve Tutumlarina Etkisi ile Icerige Yonelik Ogretmen ve Ogrenci Goruslerinin Degerlendirilmesi [The Assessment of the Effects of Web-Based Teaching which is Designed According to "Hypermedia Design Model" in Science and Technology Classes to the Academic Performance and Attitudes of Students and the Assessment of the Views of Teachers and Students about the Content of Web-Based Teaching](Doctoral dissertation). Dokuz Eylul University Graduate School of Educational Sciences, Izmir, Turkey. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 265514.

Cetinkaya Aydin, G. 2020. "COVID-19 Salgini Surecinde Ogretmenler". Tedmem., Retrieved May 17, 2020 from https://tedmem.org/covid-19/covid-19-salgini-surecinde-ogretmenler.

Delaney, G., Jacob, S., Iedema, R., Winters, M., & Barton, M. (2004). Comparison of faceto-face and videoconferenced multidisciplinary clinical meetings. *Australasian Radiology*, 48(4), 487–492.

Durak, G., Cankaya, S. & Izmirli, S. (2020). COVID-19 Pandemi Doneminde Turkiye'deki Universitelerin Uzaktan Egitim Sistemlerinin Incelenmesi [ Examining the Turkish Universities' Distance Education Systems During the COVID-19 Pandemic]. *Necatibey Faculty of Education, Electronic Journal of Science and Mathematics Education,* 14(1), 787-809.

Eygu, H., & Karaman, S. (2013). Uzaktan Egitim Ogrencilerinin Memnuniyet Algilari Uzerine Bir Arastirma [A Study on the Satisfaction Perceptions of Distance Education Students]. *Kirikkale Universitesi Sosyal Bilimler Dergisi*, 3(1), 36-59.

Falowo, R. O. (2007). Factors impeding implementation of web-based distance learning. *AACE Journal*, 15(3), 315-338.

Galusha, J. M. (1997). Barriers to learning in distance education. *Interpersonel Computing and Technology: An Electronic Journal of the 21st Century*, 5(3-4), 6-14.

Gokcek, T. (2019). Karma Arastirma Yontemi [Mixed Research Method]. In H. Ozmen & Orhan Karamustafaoglu (Ed.), *Research Methods in Education* (pp. 388-435). Ankara: Pegem Akademi.

Gokdas, I., & Kayri, M. (2005). E-ogrenme ve Turkiye acisindan sorunlar, cozum onerileri [E-Learning and Turkey in terms of problems, solution]. *Yuzuncu Yil Universitesi Egitim Fakultesi Dergisi*, 2(2).

Greene, J.C., Caracelli, V.J., & Graham, W.F. (1989). Toward a conceptual framework for mixed- method evaluation designs. *Educational Evaluation and Policy Analysis*, 11(3), 255-274.

Horzum, B. (2003). Ogretim elemanlarinin internet destekli egitime yonelik dusunceleri (Sakarya universitesi ornegi).Yuksek lisans tezi. Sakarya Universitesi Sosyal Bilimler Enstitusu, Sakarya. [Ideas of lectures about internet based education (Sakarya University Examples)] (Master's dissertation) Sakarya University Graduate School of Social Sciences, Sakarya, Turkey.Sakarya. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 136842.

Horzum, M. B., Albayrak, E. & Ayvaz, A. (2012). Sinif Ogretmenlerinin Hizmet Ici Egitimde Uzaktan Egitime Yonelik Inanclari. [Elementary Classroom Teachers' Beliefs on In-Service Training via Distance Education]. *Ege Egitim Dergisi* 13(1), 56–72.

Hwang, G.J. & Chang, H.F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education*, 56(4), 1023–1031.

Isman, A. (2005). *Uzaktan Egitim [Distance education].* Ankara: Ogreti Press.

Isman, A. (2011). *Uzaktan Egitim [Distance education]*. Ankara: Pegem Akademi Press.

Javed, S. H. (2008). Online facilitated mathematicss learning in vocational education: A design-based study. Unpublished doctoral dissertation. Victoria Universitesi.

Karip, E. 2020. "COVID-19: Okullarin Kapatilmasi ve Sonrasi", em. Retrieved May 1, 2020 from https://tedmem.org/vurus/covid-19-okullarin-kapatilmasi-ve-sonrasi.

Kaleli-Yilmaz, G. & Guven, B. (2015). Ogretmen Adaylarinin Uzaktan Egitime Yonelik Algilarinin Metaforlar Yoluyla Belirlenmesi [ Determining the Teacher Candidates' Perceptions on Distance Education by Metaphors] *Turk Bilgisayar ve Matematik Egitimi Dergisi*, 6(2), 299-322.

Koc, M. (2017). Learning analytics of student participation and achievement in online distance education: A structural equation modeling. *Educational Sciences: Theory & Practice,* 17, 1893–1910.

Koparan, T. & Yilmaz, G.K. (2020). Matematik Ogretmeni Adaylarinin Mobil Ogrenme Ile Desteklenen Ogrenme Ortamina Yonelik Gorusleri [Opinions of Pre-Service Mathematicss Teachers' on the Learning Environment Supported by Mobile Learning]. *Uludag Universitesi Egitim Fakultesi Dergisi,* 33(1), 109-128.

Koppelman, H., & Vranken, H. (2008). Experiences with a synchronous virtual classroom in distance education. *ITICSE'08 Madrid,* 194-198.

Li, X. (2009). Review of distance education used in higher education in China. *Asian Journal of Distance Education*, 7(2), 22-27

Li, K., Uvah, J., Amin, R., & Hemasinha, R. (2009). A study of non-traditional instruction on qualitative reasoning and problem solving in general studies mathematicss courses. *Journal of Mathematicsal Sciences and Mathematicsal Education*, 4(1), 37-49.

Lin, C. (2009). A comparison study of web-based and traditional instruction on preservice teachers' knowledge of fractions. *Contemporary Issues in Technology and Teacher Education*, 9(3), 257-279.

Marsh, B., Mitchell, N., & Adamczyk, P. (2010). Interactive video technology: Enhancing Professional learning in initial teacher education. *Computer & Education*, 54(3), 742- 748.

Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education*, 68, 76-85.

Ozgol, M., Sarikaya, I., & Ozurk, M. (2017). Orgun egitimde uzaktan egitim uygulamalarina iliskin ogrenci ve ogretim elemani degerlendirmeleri. [ Students' and Teaching Staff's Assessments Regarding Distance Education Applications in Formal Education]. *Journal of Higher Education and Science,* 7(2), 294-304.

Ozyurt, H. (2012). Implementation and evaluation of a web based mathematicss teaching system enriched with interactive animations for the probability unit. *Energy Education Science and Technology Part B-Social and Educational Studies*, 4(3), 1167-1180.

Paden, R. R. (2006). A comparison of student achievement and retention in an introductory math course delivered in online, face-to-face, and blended modalities. Unpublished doctoral dissertation. Capella University.

S. Wood, (1998). *On-line Supported Subjects: A Practical Handbook for Academics*, CELT, Charles Sturt University,

Sharples, M., Taylor, J., & Vavoula, G. (2005). Towards a theory of mobile learning. *In Proceedings of m-learn Conference*. Cape Town, South Africa.

Song, Y. (2014). Bring your own device (BYOD) for seamless science inquiry in a primary school. *Computers & Education*, 74, 50-60.

Surasi, B., & Basbakanlik, T. (2002). *Bilgi Toplumuna Dogru*. ODTU Kultur ve Kongre Merkezi, Sonuc Raporu, Ankara.

Tekin, H. (1996). Egitimde Olcme ve Degerlendirme. [ Measurement and Evaluation in Education.]. **(9th Edition)**, Ankara: Yargi Press.

Tryon, P. J. & Bishop, M. (2009). Theoretical foundations for enhancing social connectedness in online learning environments. *Distance Education*, 30(3), 291-315.

Tsuei, M. (2012). Using synchronous peer tutoring system to promote elementary students' learning in mathematicss. *Computers & Education*, 58, 1171-1182.

Tucker, S. (2001). Distance Education: Better, Worse, or As Good As Traditional Education? *Online Journal of Distance Learning Administration*, 4(4).

UNESCO. (2020). *COVID-19 educational disruption and response*. Retrieved April 17, 2020 from https://en.unesco.org/covid19/educationresponse

Usun, S. (2006). *Uzaktan Egitim [Distance education].* Ankara: Nobel Yayin Dagitim.

Yazici, A., Altas, I., & Demiray, U. (2001). Distance education on the Net: A model for developing countries. *Turkish Online Journal of Distance Education-TOJDE*, 2(2), 24- 35.

Yenilmez, K., Turgut, M., & Balbag, M. Z. (2017). Ogretmen Adaylarinin Uzaktan Egitime Yonelik Tutumlarinin Bazi Degiskenler Acisindan Incelenmesi. [ Investigation of Prospective Teachers' Perceptions on Distance Education with Respect to Certain Variables]. Erzincan Universitesi Egitim Fakultesi Dergisi, 19(2), 91-107.

Yorganci, S. (2014). Web Tabanli Uzaktan Egitim Yonteminin Ogrencilerin Matematik Basarilarina Etkileri [The Effects of Web Based Distance Education Method on Students' Mathematicss Achievements]. *K. U. Kastamonu Egitim Dergisi,* 23 (3), 1401-1420.

Yorganci, S. (2013). The effects of web-based distance mathematicss instruction on mathematicss attitudes and achievements: The case of Erzurum Vocational School. *Ejoir*,1, 64-83.

# THE DIGITAL DIVIDE AND HIGHER EDUCATION CHALLENGE WITH EMERGENCY ONLINE LEARNING: ANALYSIS OF TWEETS IN THE WAKE OF THE COVID-19 LOCKDOWN

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## ABSTRACT

While literature reveals the positive perception of online learning, this study examines the issues caused by the digital divide for students at South African universities during the 2020 academic year. The study reveals the perceptions and experiences of university students from historically marginalised and privileged universities. This research ventures into relatively unexplored territory by examining the digital divide in the wake of the COVID-19 pandemic and radical shift to online learning. Using netnography, 678 tweets were analysed using qualitative content analysis and the concept of "digital divide," "online learning" and "student voice." We argue that digital media in the digital divide suffuses socio-economic relationships between university students and management. The study provides insights into the role of 4IR, the technological, digital inequalities, environmental, situational and institutional barriers/disparities students faced during remote learning and assessment. Results reveal, online learning did not increase the accessibility of university education during the pandemic for students attending marginalised universities. Network coverage, device type, time of day, socio-economic status and digital competence negatively affect synchronous lecture participation and attendance. More inclusive and flexible pedagogy based on a university's resources and student profile is needed to mitigate digital and educational inequalities affecting students from rural and/low-income households.

**Keywords:** Digital divides, online learning, remote learning, higher education, COVID-19 pandemic.

## INTRODUCTION

The academic year of 2020 saw a global outbreak of a new highly infectious disease, COVID-19 disrupting the world population, reshaping people's lives and higher education delivery conventions. The South African government declared a national state of disaster under Section 27(1) and Section 27(2) of the Disaster Management Act on 15 March 2020 – in response to the Covid-19 pandemic. Although online learning in higher education was mainly the result of the fast-paced developments in ICT for the ever-evolving digital economy (Palvia et al., 2018), the COVID-19 related lockdown restrictions radically forced the shift to online learning. COVID-19 forced higher education institutions (HEIs) in South Africa to weigh health recommendations against the needs of students, many of whom are casualties of the digital divide separating those who have unfettered Internet access and those who do not. A growing measure of discontent with the process of swiftly converting to online delivery at HEI's during the coronavirus pandemic and subsequent lockdown was met with tremendous criticism from marginalized students, concerned academicians and citizens. Mainly due to concerns that marginalized student's diminished access to devices and data and socio-econmic status created significant barriers to the remedial intent of emergency online teaching. Therefore it accentuated the pre-existing digital divides experienced by students.

## LITERATURE REVIEW

### The Digital Divide

As the most unequal society globally, South Africa's pre-existing digital divides are further accentuated by its income and wealth inequalities (Czerniewicz et al., 2020) which in turn affect marginalized students' digtal proficiency as they struggle to access and/or adapt to technologocal developments. Previous research into the inequalities arising from the emergence of digital technologies has incorporated socioeconomic factors, especially gender, age, race educational level, income, and habitat (Hasan & Bao, 2020, Czerniewicz et al., 2020). Soomro, Kale, Curtis, Akcaoglu and Bernstein (2020 p.1) suggest the "digital divide centres on access to various dimensions of information and communication technology (ICT) including physical access, motivation, skills, and actual usage of digital technologies." While other researchers' conceptualisation of the "digital divide" focus on the lack of equity in the access and use of ICTs (Hidalgo, Gabaly, Morales-Alonso & Urueña, 2020). The divide also refers to the gap between the "haves" and the "have-nots" in terms of access to online learning and resources for education purposes. Therefore, access and inequity are central concepts to this complex construct. Associated inequities can come in the form of

1. unequal access to technologies (first-level digital divide);
2. unequal development of the relevant skills needed to navigate the Internet as well as information literacy skills to seek and evaluate information (second-level digital divide) and;
3. the disparate benefits of technology usage according to socioeconomic status (third-level digital divide) (Lombana-Bermudez, Cortesi, Fieseler, Gasser, Hasse, Newlands & Wu, 2020 p.11). Usage skills involves the frequency, duration of time, and types of activities performed.

Despite a growing number of studies into technological adoption within teaching and learning at South African HEIs in the wake of COVID-19 lockdown restrictions (Mhlanga & Moloi, 2020), there is a need for studies that explicitly consider the technology and assessment utilisation of students in this emerging context. Previous studies have identified the lack of digital infrastructure, affordability and skills as the primary digital divide challenges in emerging economies (Duffy & Ney, 2015). Numerous studies focus on academics' perspectives of technology and assessment, including a critical emphasis on the instructors' voice within digital technology use (Dwivedi et al., 2020). A few studies investigate issues critical to the student's experience of the digital divide with even fewer during a crisis. A need for student centred perspectives is needed to identify specific challenges, readiness and circumstances arising from the digital divide in times of crisis. Our research utilises Twitter data to assess this issue.

The paper is organised as follows. First, we discuss COVID-19's impact on HEIs in an emerging context. Specifically, online learning challenges, blended and hybrid models, Generation Z and the youngest Millennial student's learning dynamics, their digital literacy and the existing digital divides exposed during the pandemic. Following this, we will explain the methodology, then present and discuss the findings.

### Online Learning Challenges

Higher education is celebrated as a vehicle for economic success but concerns about unequal access to new technologies, integrated within the concept of digital divide, has been a topic of study since the use of the Internet began to be prevalent among the population (Hidalgo et al, 2020). Literature shows learning that is facilitated by electronic technologies (known as online, distance, or e-learning), can be either fully online, mixed modes (known as hybrid or blended), or web assisted (Reilly, Gallagher-Lepak & Killion, 2017). Gloria and Uttal (2020) define a fully online course as electronic or e-learning in a virtual computer learning space using a technological approach that allows students to learn without being in the same classroom as the instructor. Also known as distance or "remote learning" through the use of technology, the online classroom can occur as either a synchronous (where the teaching takes place live online) or asynchronous process and creates greater flexibility in where and when students learn (Lee, 2017). Blended classes use face-to-face teaching and technology-mediated channels to enhance interactive, engaging learning experiences and to improve student-learning outcomes (Auster, 2016). Blended course design, hybrid or mixed modality course design and flipping the classroom all describe the same approach. Although, online education is touted as a 'revolutionary' solution to diverse educational problems of inequality (Lee, 2017) key barriers were identified during the lockdown.

## Digital Disparities during the Covid-19 Lockdown

Beaunoyer, Dupere and Guitton (2020) investigated digital disparities during COVID-19 periods. While most educational institutes are adopting online classes (Yen, 2020; Zhou, Wu, Zhou & Li, 2020), the question arises – how this approach benefits students from low-income household and remote areas? Due to digital inequalities and lack of access to current technology, students from lower-income families have limited or no access to online classes. At the same time, excessive data costs present an obstacle to access online-classes (Adam, Kaye & Haßler, 2020). In light of this, academics question the rationale of making use of sophisticated technology when students stand to be "disadvantaged" by it. They argue that converting a face-to-face course into a blended or online format is not a simple matter of moving ideas onto an online learning management system (Gloria & Uttal, 2020:139). The different ways a student receives study material and the relationship between the lecturer and student need consideration. Worley and Tesdell (2009) argue that online courses require instructors to ask both pedagogical and technological questions that address the following. The most effective ways to facilitate student learning in online environments without the person-to-person immediate interactions of a classroom and finding ways to stay up-to-date with emerging online teaching technologies that offer students the best online learning options and the optimal course-management system to adopt (Worley & Tesdell, 2009). Perhaps, blended and hybrid models are better suited to address the challenges presented by the three categories of the digital divide mentioned earlier.

## The Digital Literacy and Curriculum Delivery for Generation Z

Generation Z or Gen Z, are the cohort of people born after the millennial generation. Generation Z are currently undergraduate students at HEIs. Literature touts Gen Z as more adept in the digital, visual, and global realms than previous generations (Mosca, Curtis & Savoth, 2019). Mosca, Curtis and Savoth (2019) describe its members as having never known life without the internet. In the South African context this is probably the case for the haves more than for the have nots. Universities from developed contexts, are changing pedagogy on the premise that Gen Z, live a big part of their social lives via texting and social media, where technology has blurred the lines of studying, entertainment, their private and public life. Responding to Generation Z's significant online content consumption, such universities are diversifying their course delivery platforms, including fully online, blended learning, and face-to-face courses (Yu & Canton, 2020). However, the digital divide and educational inequalities remain a significant societal problem in South Africa's emerging context, affecting disadvantaged students from low income households. Accordingly, universities are challenged to meet the needs of students with varying levels of technological readiness with deficiencies in information and digital literacy shown to be a hindrance to student success (Takavarasha, Cilliers & Chinyamurindi, 2018).

Digital literacy refers to the capability to comprehend and use information in several formats from a wide range of sources when it is presented via computers. The concept of literacy is not only limited to simply being able to read; it has always meant the ability to read with meaning, and to understand. Digital literacy or digital competence (i.e. information literacy, ICT skills, and technological literacy) is part of the competencies for lifelong learning (Martínez-Bravo, Sadaba-Chalezquer & Serrano-Puche, 2020). Evolving digital divides in information literacy manifest with students who struggle to use digital tools (Reedy & Parker, 2018). Digital tools are the devices, gadgets and various software and hardware artefacts that influence one's ability to learn how to use digital platforms for engaging in social, business and educational activities in a responsible and safe manner (Takavarasha et al., 2018). Historically Black universities were marginalised prior to South

Africa's transition to democracy in 1994 and still have legacy issues that hinder their delivery. We refer to them as marginalised universities and their historically white and resourced counterparts privileged universities. Marginalised universities serve the majority of Black African and previously disadvantaged university students (Mzangwa, 2019). For marginalised universities, not only is technology access and device ownership less prevalent than at privileged institutions, but students are less prepared to use the internet, core computer applications, and digital library/scholarly resources for academic pursuits (Takavarasha et al., 2018). Kajee and Balfour (2011) highlight that in South Africa, an advantaged elite minority have multiple access routes to digital literacy in their sociocultural environments.

## The Digital Divides amongst University Students

A less privileged majority still come from under resourced sociocultural backgrounds where digital technology is rare, and access is unevenly distributed (Kajee & Balfour, 2011). Due to the COVID-19 lockdown, universities transitioned to emergency online learning even though not all students have easy access to Wi-Fi off campus. This became an issue when public universities asked students to move out of student residences and closed their campuses. Closing universities and taking students and educators out of face-to-face lecuture interactions is a pedagogical transformation that requires rapid mobilization across all university staff and resources for what scholars describe as emergency remote education (ERE; Bozkurt et al., 2020), emergency remote teaching and learning (ERTL; Czerniewicz et al.,2020), or re-engineered distance education (Bozkurt & Sharma, 2020). This is in contrast to experiences that are planned from the beginning and designed to be online, emergency remote teaching (ERT) is a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances (Hodges, Moore, Lockee, Trust & Bond, 2020).

Based on a review of relevant higher education scholarship, the authors grappled with the tensions that arise when educators harness digital technology for student learning, meet marketplace needs, and improve livelihoods during a pandemic. Marginalised university students, from the historically disadvantaged poor economic backgrounds, acutely experience digital divides and evolving inequalities (Mzangwa, 2019; Takavarasha et al., 2018). Drawing upon the data captured on Twitter's microblogging social media platform, the present qualitative study explores students' user generated content regarding online learning. It further explores, their thinking when assessing the attitudes of various South African universities, their beliefs and behaviours related to online learning during the COVID-19 related lockdown and why different university management are unable to provide a shared response to student's demand of inclusion concerning online learning. The challenges include the disruption of the academic calendar, the redesigning of assessment standards and access to digital tools.

Main research objective: To explore the sentiments expressed on Twitter by South African University Students during the COVID-19 lockdown about the rapid migration to remote/online learning for the 2020 academic year.

Secondary research objective:

- To explore how the digital divide affects students from resourced and marginalised universities
- The students' perceptions of the modes of teaching and learning remotely

## RESEARCH QUESTIONS

We ask the following research questions:

- What are the challenges faced by university students during the rapid shift to emergency online learning during the COVID-19 lockdown?
- What are the disparities faced by university students during the rapid shift to emergency online learning during the COVID-19 lockdown?

## METHODOLOGY

### Background

On March 15 2020, the University of Johannesburg (UJ) closed until further notice and all graduations were postponed. Students were asked to leave UJ residential facilities. After the government mandated lockdown was extended, HEIs had to embark on a radical shift to online learning.

A month after, accessibility to online learning began to trend on social media perhaps because of its sensational nature, and even attracted the attention of other South African university students from across South Africa. These included the University of the Western Cape, University of Pretoria, Univerity of Kwazulu Natal, Univerisity of Witwetesrand, and Walter Sisulu University. UJ management pledged their assistance to disadvantaged students. On the eve of the second term commencing at UJ, the negative sentiment that had dominated the hashtag which attracted news media's attention was quelled and UJ students resumed their academic studies. However, students from the University of Fort Hare (UFH) were battling to receive resources, support and media attention. In consequence, UFH management was not able to supress the issues raised by their students and by the time we stopped data collection the #UFHNEEDSHELP hashtag was ongoing. These juxtaposing scenarios provided the inspiration for our methods and the motivation for this paper.

### Data Collection and Participants

Data was collected from Twitter between 29 June 2020 and 31 July 2020. Students started the #BoycottOnlineLearningUJ hashtag on April 16, 2020 in protest to UJ's announcement to use remote learning. On 2 June 2020, students from UFH started trending with the #UFHNEEDSHELP, #RescueUFH and #SaveUFHAcademicYear hashtags. For the purpose of data collection, Twitter's search interface (https://twitter.com/searchhome) was queried using the words, phrases and hashtags such as remote learning, #BoycottOnlineLearningUJ, #NothingForStudentsWithoutStudents, #UFHNeedsHelp and "#boycottonlinelearning. The tweets collected for this enquiry are demonstrative rather than representative. Meta-data such as number of retweets, replies, and date of contribution were also collected. We downloaded the data, we each went through the data, we grouped the similar tweets based on emerging themes and we then used excel to breakdown of themes.

### Sample, Coding and Analysis

Six hundred and seventy-eight tweets were collected and 20 irrelevant tweets were eliminated. Although the majority of tweets for both hashtags were posted by different students, there were a few examples of students that were posting more in comparison with other users, particlualry at UFH. The remaining 658 tweets were analysed. The volume of tweets relates favourably with previous studies that involved manual coding (Aharony, 2012). Data were first analysed using Atlas ti. software, and exported to an Exel spreadsheet and Microsoft Word for additional coding and further analysis using qualitative content analysis. We used an inductive approach to condence the tweets. Specifically, the analytic induction process involved both researchers who interpreted 658 tweets vigilantly and assigned them to relevant categories. Using Exel, we were able to identify categoriesbased on similarities in tweets. Agreement on the labels were achieved through the repetitive coding of the tweets. Content analysis is a reputable and widely applied tool for previous studies, including higher education research (Kebritchi, Lipschuetz & Santiague, 2017). Duplicate tweets were identified and the second tweet was not counted.

We adhered to recommendations set out by Christensen and Larsen (2020) regarding the collection, analysis and presentation of Twitter data. No ethical approval was required as all data (tweets) were retrieved from the public domain and would not constitute an ethical dilemma in internet research. However, all tweets were anonymised with metadata and tweet content were stored separately for ethical considerations. We did not include any tweets that constituted hate or libellous speech. For ethical considerations in internet research, the data collection process entailed removing personal identity data for all tweets collected from Twitter (Ahmed, Bath & Demartini 2017). Although quoting a tweet ultimately identifies the source even when the names of participants are anonymised, an effort was made to create some confidentiality by de-identifying participants. Anonymity is applied in order to avoid harm including judgements and/or potential ridicule (Ahmed et al, 2017) we used quotes with no handles/usernames (Beninger, Fry, Jago, Lepps, Nass, & Silvester, 2014) and no photos. Although Twitter data is a rich data source that provides insights into peoples' genuine opinions, it has its limitations. Twitter data is not representative of the general public (Blank, 2017). It is based on self-selection on several levels, in our case data is only collected from people who have internet access, who have a Twitter account and who decided to contribute to the respective hashtag thread..

## RESULTS AND DISCUSSION

To our knowledge, this study is the first to analyse the usage of Twitter by students, activists and sympathisers in response to remote learning or online during COVID-19 lockdown restrictions in South Africa. Tweets were categorized into five major topical themes. Themes highlighted issues related to: (1) The inevitability of the fourth industrial revolution (4IR), (2) digital inequalities and technological barriers to online learning for students, (3) environmental and situational barriers for students, (4) challenges with online teaching and learning (5) historical and institutional barriers/disparities.

### Theme 1: The Fourth Industrial Revolution is Inevitable

The first striking theme to emerge from analysis is the notion of 4IR as inevitable in the context of lockdown. Davis (2016, p.11) describes 4IR as "the advent of cyber-physical systems involving entirely new capabilities for people and machines." Unlike the third industrial revolution, 4IR takes technological advancement to new levels. "The fusion of technologies is blurring the lines between the physical, digital, and biological worlds" (Davis 2016, p.11). This concurs with the general view around the increased digitalisation of work(places), new "types" of students will emerge who may be more digitally competent than previous generations due to their "digital native" status (Gillett-Swan, 2017). For this to happen, students would need to come to university with the digital literacy, access and usage skills to participate in 4IR mediated learning environments. However, the literature paints a picture of persistent divides. Participants who posted about the inevitability of 4IR emphasize the compelling evidence of the disruptive capability of the technology driven transformations of business and human activities (Oke & Fernandes, 2020), and in the teaching and learning context (Radha, Mahalakshmi, Kumar & Saravanakumar, 2020). In highlighting the importance of technological advancement for learning one user tweeted:

> We are approaching 4IR, therefore like you said, #elearning is inevitable.

COVID-19 and the subsequent lockdowns around the world and reports in the media were a huge catalyst for the digital transformations of many sectors. Organisations and individuals had a new normal thrust upon them and used virtual spaces and digital tools for work, studying and leisure. In recognition of the emergence these sweeping changes they were witnessing, another user makes a subtle reference to inequality as the problem while accepting the importance of online learning.

> Our problem is inequality not online learning. Online learning is inevitable. The best we can do is to help students with resources as we do with food parcels.

Literature suggested that students "from disadvantaged backgrounds need even more support and care than students from well-to-do backgrounds" (Guri-Rosenblit, 2009, p.11). In a sense this user, likens access to digital resources for students as a fundamental need such as food. Despite the necessity to prepare for emerging digital contexts by skilling, reskilling and upskilling marginalised students to participate in 4IR, one user cautions university management from using students as guinea pigs:

> We can't allow the university to practice and test 4IR at the expense of student's academics.

This statement also reveals students limited grasp of 4IR. Online teaching does not equate to 4IR, unless instruction heavily relies on 4IR technology. The drastic shift in teaching approaches employed during the lockdown raised questions in the minds of students about the quality control and reputation of the offering and the outcomes at universities as articulated by these users:

> A rapid radical shift in the teaching and learning methodology without proper planning and revision of strategy will compromise the prestige and credibility of certain qualifications, students and the contact university community.

> We cannot be subjected to online learning especially on a short notice.

Not only were students concerned about the quality of the offering but they perceived universities as subjecting them to the possibility of failure due to being ill prepared to meaningfully engage online either because they lacked temporal and material resources. Students expressed a distrust of the approach universities adopted and their impact on marginalised students. They were worried that no one had their interests at heart, as online learning is a resource intensive approach.

> The way universities are going about it suggests that they are gambling with the degrees of the poor.

Specifically, students positioned online learning as a threat to throughput rates and increasing the possibility for academic exclusions because they believed it would require a steep learning curve:

> Can the University of UJ please introduce e-learning once they can assure us that no student will be left out, no one will be academically excluded and everyone has access to ulink and Blackboard with a proper functioning device.

> I don't think we are in a position to successfully roll it (online learning) out now considering the many facets of our society.

Differences in capabilities were noted amongst different categories of institutions.

> Predominantly white universities will succeed in their migration to online learning, but what about Black universities and colleges?

Despite these misgivings, students recognised the need to save the 2020 academic year and the best strategy to achieve this.

> E-learning is the only apparent solution to save the 2020 academic year.

However, others advocated for a blended learning versus fully online approach to address the issues of preparedness of students and institutions as advocated by this user:

> … Going forward, it (online) needs to be used hand in hand with contact learning.

This indicates that students were not entirely resistant to online instruction but took issue with the speed with which it was introduced. They probably would have accepted it more readily using a blended approach.

Although it was not possible during the lockdown, educators should recognize the need for hybrid approaches to address the needs of a diverse student profile (Auster, 2016). Despite being branded  netizens, it seems South African Generation Zs prize face to face instruction over computer mediated approaches. Therefore, to successfully promote online learning, universities should not substitute traditional face-to-face instruction with online learning methods, but rather use a combination (Takalani, 2008).

## Theme 2: Digital Inequalities and Technological Barriers to Online Learning for Students

The second theme highlights the lack of hardware, concerns of access to Wi-Fi, network challenges students faced and the cost of data for online learning during lockdown.

### Disadvantaged Student's Lack of Devices

The following tweets highlight the device challenges faced by the most marginalised students before the lockdown. Either such students lacked devises or their devices had limited functionality.

> My homie uses those R150.00 (+/-$8) phones (feature phone with a small screen) and doesn't have laptop. I wonder how he will be able to access online learning, he relies on me even for him what's happening at VUT via social networks.

> Other students don't even have smart phones/laptops to type assignments.

> Undertaking online learning means being reliant upon network adapters, power, devices, servers, routers and software.

Material access is the commonly mentioned type of digital divide, involving the physical access to an internet connection, the costs for hardware, software, and service (Reilly et al., 2017). To mitigate the lack of devices for marginalised students, universities have computer labs equipped with printing facilities. Students also have access to free Wi-Fi on campus and university run residences. There are often long lines at the labs due to demand.  Although smartphones afford students with better access than feature phones, they are not ideal for long assignments. During the lockdown, students had no access to these facilities.

### Network Coverage Challenges–Remote and Underserviced Areas

Network challenges for students manifest as an urban rural divide. During the lockdown, remote learning was problematic for students based in rural areas due to infrastructure that online learning requires. As argued by Mhlanga and Moloi (2020) the rural areas are plagued with a number of challenges related to poor internet connectivity, and the poor state of infrastructure. Users noted the following about network coverage where they live:

> The problem is some villages have no network.

An issue affecting both rural and urban dwellers that had access to a network, revolved around network speeds, bandwidth and the household demand. Note the number of users on the Wi-Fi router.

> Pros and cons of internet speed in SA, when you put 5-10 users in one Wi-Fi router, we can't watch a single YouTube video at once. Buffering for ever.

This also gives an indication of the level of possible overcrowding at home. This issue is dealt with in more detail in theme three.

### Prohibitive Data Costs

The prohibitive costs of data for online learning was a common theme as evidenced by the following tweets

> My brother is at UKZN, right now he's home! He won't be able to participate in this online learning thing because as much as he has a laptop, at home we won't afford to buy him that much data …

> Online classes, assignments, assessments and exams would require over a thousand gigabytes of data which students at home can hardly afford and not forgetting poor network coverages and learning materials left at respective reses.

Students whose household income is not low enough to satisfy criteria for government bursaries nor qualify for bank loans face the following dilemma.

> The data is too expensive for missing middle students to keep up with their online studies every day.

To mitigate these costs, Mhlanga and Moloi (2020) explain that the government of South Africa went into partnership with mobile network operators (MNO) to offer zero-rated applications and educational websites. An application or website is defined as zero-rated when an MNO does not count the usage of the application or website against a user's monthly data allotment, which renders its use as effectively free (Mhlanga & Moloi 2020). The main MNOs such as Vodacom, Cell C, and MTN, agreed. However, not all the platforms students used for learning are zero-rated and therefore require buying of data.

> What's the point of making blackboard zero rated but lecturers still requesting us to submit assignments via emails?!

Although students have access to various journals, periodicals through their institutional library for the purposes of research, their preference for Google's search engine over their institutional repository is notable.

> Also, UJ has made Ulink (Blackboard) free and while that is appreciated, Ulink doesn't have our study materials, it's not the site where classes happen, it's also not the site where we do research.

> …Blackboard might be free … but Google isn't.

## Theme 3: Environmental and Situational Barrier for Students

The review of tweets revealed that issues related to environmental and situational barriers are summarized into students' home environment.

### Non-conducive Study Environment

This theme relates to students affected by non-conducive study environments in their home environment. Particularly for students living in poverty and/or informal settlements. Informal settlements are characterised by poor living conditions that lack water and sanitation and sometimes electrification depending on the location and age of the settlement as evidenced in the images below. Users retweeted two images and noted:

> … Some students are staying in environment that cannot be conductive for them to cope and study.

Informal settlements are densely populated and often have many people sharing one room. They lack infrastructure and experience high levels of poverty, overcrowding, violent crimes such as robbery, gender-based violence and murder. The images paint a vivid picture of the specific challenges marginalized university students face during online learning. One user tweeted:

> This is the place we call home so according to UJ we have a perfect data connection, peacefulness and it's … conducive … for us to catch up with studies daily and write exams.
>
> Don't confuse staying here to get through high school (as) the same as staying here to get through varsity via online learning, because it's not the same.
>
> As a poor student from the townships have been struggling with this online thing.

For students with disabilities, particularly those living in poverty, the barriers and marginalization were compounded by a lack of access to university support services**.**

> There are so many physical disable(d) students at @go2uj who rely on the institutions' resources for learning. Currently, they do not have any access to such resources, such leaves them at a disadvantage to learn and move with this online learning.

### Environmental Distractions and Interruptions

Students from different socio-economic circumstances complained about various distractions in their home environment. Interruptions and home responsibilities heightened the inability for affected students to fully participate in any live, scheduled contact. Many users complained about lacking a quiet place to study and participate in class. Commitments such as chores during live lectures also affected the attendance and participation of students. This user explains:

> Online learning is effective currently. The problems we face at (our) homes hinders some of us living with parents who misunderstands. Our parents don't tolerate such, you'll be doing chores all day, we can't Even sleep or get any chance to write. *Stepmoms.
>
> I also need to take care of my siblings, in the midst of this where do I get the chance to sit down and open a laptop and study? Meanwhile somewhere in Lovemore Heights or Sandton (affluent suburbia) there's John or Tracey who has wifi at home and goes to the study room to study.

The contextual challenges presented in this theme negatively contribute to the poor performance and participation of students during synchronous lectures and assessments. It is therefore important to examine student's experiences of online teaching and learning to help educators design better learning experiences that do not disadvantage students.

## Theme 4: Students Experiences with the Modes of Teaching and Learning

The next theme deals with the challenges with synchronous lectures and assessments, and the technical challenges experienced by students. Students' readiness to attend online courses is one of the major issues discussed in tweets. Not all students can successfully participate in online courses. Adopting and accessing online teaching and learning, internet access required to participate in online courses can be challenging for students as highlighted in themes one to three. University educators must design their course delivery with students that have extraneous circumstance in mind. Specifically rolling out narrowly timed online education.

### Synchronous Lectures

Various pedagogical issues were raised around the timing of lectures. Synchronous teaching is data consuming and the poor connectivity challenges made it hard for students to attend live online sessions. Students expressed concern about lack of bandwidth for live video lectures regardless of the application being used (Blackboard Collaborate, Zoom or YouTube).

> It's (an) inconvenience for students from rural areas,… other lecturers want to be live on YouTube.

Although Zoom is purported to be less data intensive than YouTube it still presented challenges for students with connectivity issues.

> Students are told to attend classes on Zoom yet they stay in rural areas that have poor network connectivity.

Furthermore, students accessing live Blackboard Collaborate sessions using unstable Wi-Fi connections get kicked out when there is a break in the connection. Other users complained of being unable to connect at certain times of the day:

> Zero rated gets congested midday, in the morning it works perfectly.

Therefore, an unreliable network and poor connectivity were among the challenges that make it difficult for students to join live lectures or sustain an uninterrupted connection for the duration of their lecture. Consequently, not all students can attend these sessions. The same is true for online assessments

### Synchronous Assessments

Many students' expressed feelings of frustration and helplessness around submission criteria and/or requirements for assessments that disadvantages students.

> If … the connection becomes compromised ….(it) may result …(in) … failing a test.

> We writing Test 1 online, we all know how Ulink works once you disconnect for a second ,your attempt submits a Boom here comes your fail.

> Imagine living in an area where you have to turn flight mode on and off to get 4G coverage and then … do your timed quizzes.

> UJ: This exam can only be completed in one sitting. The exam will be available for 2 hours from 12:00 -14:00. Make sure you have a stable internet connection as the test allows only 1 attempt. MTN: your anytime data is finished. MTN: No internet connection.

> Where am gonna write online test? Laptop. It's winter, load shedding for one etc.

When lockdown commenced, Eskom, a national electricity service provider, was conducting rolling blackouts nationally to stabilise the national power grid. This effectively meant that if a lecture, assessment or consultation was scheduled during such a period not all students could participate/complete an assessment.

They would need enough battery life for their devices (laptops, mobile routers etc) or an alternate internet connection if they had fibre. As a result, students preferred the flexibility that asynchronous lectures and most probably for assessments, provided them with. One student stated:

> I like this online learning thing because I attend class whenever I'm ready to.

One user lamented the frequency of assessments implying that some lecturers' substituted face to face lectures with over assessment.

> When they said online learning, this is not what I had in mind. Everyday there is something due.

### Technical Difficulties Related Software and Applications

Despite studies' acknowledgement of the benefits of online learning, technical issues can affect software functionality, user experience and lead to frustration. Building on theme three, other software related limitations to student lecture interactions and synchronous interactions were noted:

> … Specific softwares such as Blackboard can slow down interaction and provide limits to functionality while also adding to the time limitations and frustrations experienced by both staff and students.

Students did not always seamless experiences using institutionally designated apps and platforms.

> An institution (CPUT) with a server that crashes from time to time on busy days claims to be ready for online learning.

Blackboard and Blackboard Collaborate both have mobile apps designed for a mobile first student. The apps allow students to participate in online classes using a phone, tablet or laptop. However, some students experienced glitches that resulted in unplanned expenses.

> After struggling to access material on the website I resorted to downloading the Blackboard App (using my data) and MORE challenges arose... we not complaining vainly…

Depending on the institution, students could download Office 365 to access Word, PowerPoint and Excel free of charge. However, the challenge revolved around if devices had the RAM to accommodate the software

> ....There are students who aren't privileged enough to have … a laptop or phone that can run Microsoft Word?

Other challenges students faced during the lockdown were directly linked to the institutional capacity of the university they attend. Students needed support and services for the successful transition to online learning.

## Theme 5: Historical and Institutional Barriers/Disparities

An emergent theme relates to institutional disparities for marginalised universities and privileged institutions. Historically white universities such as

> …Wits, UJ and other privileged universities….

used their resources and infrastructure to address data and hardware inequalities highlighted in Theme 2.

> To ensure inclusivity of all students' #UJ secures 30GB of data per student per month and a further distribution of 4000 laptops to qualifying students as part of the remote learning programme.

> Wits is loaning (marginalised) student(s) computers and delivering them to their homes.

> All universities should follow University of Pretoria to postpone online learning until they have ensured that all the academic support is guaranteed, and all resources have been made available. UP has postponed until the 5th of May.

In contrast, historically marginalised institutions were plagued with different challenges. The majority of black disadvantaged students come from mostly rural and underdeveloped provinces in the Eastern Cape, KwaZulu-Natal and Limpopo (Dube, 2020). Two of these provinces are home to marginalized universities. While so called privileged universities were focused on the logistics of online learning. Marginalised universities were focused on damage control. Students were not all registered for the 2020 academic year.

> … Since the start of the academic year, Walter Sisulu University battled with admission and registration etc...

> At University of Venda we still have students who haven't registered up to date. Not to mention that most of the students haven't received their allowances and are told they will receive after lockdown.

Institutional inequalities caused by inability to roll out quotas for students to return to campus timeously occurred in marginalised universities.

> Other universities are done with 1st semester and now are in 2nd semester and Forte haven't done anything, some networks users haven't received their data, no catch-up plan, no laptops, some final year students haven't received their permits, no allowances.

## DISCUSSION OF FINDINGS

### Digital Access Inequalities

The study has revealed that students felt 4IR is inevitable. In the same vein Abdulrahim and Mabrouk (2020 p. 292) observed that COVID-19 accelerated transformations to 4IR that are influencing higher education and how HEIs are prepared to face particular challenges. From this research, it emerged that there were technological, pedagogical, and social challenges affecting the deployment of emergency remote online learning at marginalised universities. Despite COVID-19's abrupt disruption to teaching and learning, some students continued without significant interruptions because of online learning (Outhwaite, 2020). Previous studies confirm that many emergency remote educational approaches are dependant on internt access, data and devices for the continuation of teaching and learning (Bozkurt et al., 2020). During the university closures, existing inequalities connected to different socioeconomic situations have widened because of a lack of resources, including access to educational technology and the Internet, a lack of physical spaces to carry out home-based remote learning among students from poor backgrounds (Czerniewicz, 2020). South Africa's with its well documented inequalities, entered the COVID-19 crisis with numerous contributing factors that exacerbated the digital divide. These factors continue to widen this gap during the pandemic. Only two priveldeged universities finished their 2020 academic year on schedule. Our findings show what is described by Bozkurt et al (2020) that during this crisis, those who are privileged to have data, devices and digital literacy were able to shift to emergency remote education far better and those that do not have such affordances. This is similar to a Ghanean study which indicates that the majority of students struggle with access to the Internet and conducive learning environments (Owusu-Fordjour, Koomson & Hanson, 2020).

## Learning Environmental and Situational Barriers for Students

Social factors were also reported to hinder emergency remote learning. Coman, Tiru, Mesesan-Schmitz, Stanciu and Bularca (2020 p.14) observe "environmental disruptors such as the noise made by family members or neighbours and the lack of adequate learning space also influence the amount of time for which students can concentrate while learning online." This study highlights student frustrations around ERT and the university and government mandated removal of their campus study space. Similar to our study Coman et al. (2020 p957) confirmed that "students and staff were thrust into a lack of dedicated space to work undisturbed and the need to care for family members and especially children who must be home-schooled during the lockdown. Students reported more family responsibilities like running errands, household chores." In contrast to our study, most studies indicate students have positive attitudes towards online learning (Burac, Fernandez, Cruz & Cruz, 2019; Odit-Dookhan, 2018), despite sometimes encountering technical issues (Alsaaty, Carter, Abrahams & Alshameri, 2016). Analogous to our study Coman et al. (2020) confirm that most students' preference for face-to-face instruction and blended and hybrid models that include contact with lecturers and peers in lecture halls. Furthermore, the negative response from marginalised university authorities and critics only lowers their motivation and increases students' frustration and the risk of dropping out (Coman et al., 2020). The digital divide in South Africa follows the growing inequality gap in the country (Bozkurt et al., 2020) making some students who live in overcrowded informal settlements and rural areas lack a conducive space for learning (Aboagye, Yawson & Appiah, 2020).

## Pedagogy Experiences with Emergency Remote Online Learning

Our findings indicate that resource inequalities affected pedagogical design especially at marginalised residential universities which were unfamiliar with remote online learning. Synchronous lectures were by in large not effective (Coman et al., 2020; Williamson, Eynon & Potter 2020). Studies recommend that asynchronous activities might be more reasonable than synchronous ones. Flexibility with deadlines for assignments within courses, course policies, and institutional policies should be considered (Hodges et al., 2020). These findings confirm observations by Ramsetty and Adams (2020) who asserted that a combination of technology and in-person services has been found to help address some of this disparity, these certainly are not quick fixes, especially while in the midst of a pandemic. Others are to be aimed for in future and steadily worked toward rather than accept the current status quo (Ramsetty & Adams, 2020). Mpungose (2020) further argues that students were confused about the resources available for e-learning and the practicalites of transitioning from face-to-face to e-learning. This was compounded by the unavailability of appropriate policy to guidie an e-learning policy and a lack of instructional designers at some HEIs to provide relevant capacity building for students (Mpungose, 2020).

## Disparities between Historical Disadvantaged and Historical Well Resourced Institutions

As the world reels form the impact of COVID-19 pandemic, universities everywhere have faced enormous disruption as a result. With a disparity of resources, universities moved their teaching and learning online. This rapid shift has particular significance in the South African context, where stark disparities in Internet connectivity and infrastructure persist for historically disadvantaged universities. These divides, laid bare by COVID-19 (Priyadarshini & Bhaumik, 2020), were a major obstacle in the drive for inclusive and equitable access to higher education since post 1994. This study observed that students were concerned that the universities' rapid shift to ERT was not inclusive. Based on an argument by Bhaumik (2020), there was widening disparities in access to education during COVID-19, a deepening crisis. Our study is also in line with other studies (Czerniewicz et al., 2020) which suggest that certain students within the higher education sector life chances were cruelly diminished because of resource inequalities. In line with our findings, authors expressed that the crisis has laid open the fault line that existed through the historical, geospatial, economic inequalities of the country (Czerniewicz et al., 2020). In order to move online, Czerniewicz et al. (2020) relate that institutions made plans to address inequalities on connectivity and devices drawing from their own finances, individual universities donated, loaned, or financed for students. However, these choices were uneven, because it relied on the institutions' budget affordances and actual devices provided (Czerniewicz et al., 2020).

## CONCLUSION

The study provides insights into university student's perspectives on the emergence of 4IR in education, and the technological and digital inequalities they faced while learning remotely during lockdown. It also elucidates the barriers and challenges students experienced during class and assessments because of their socioeconomic status, spatial context and the historical barriers/disparities of their university. Although the issues faced by marginalised and privileged institutions have some overlap, the extent to which they manifest is fundamentally different. To provide an equitable education for marginalised students, their lack of resources and that of marginalised universities must be acknowledged (Lee, 2017) by the government and direct the conceptualisation and implementation of appropriate remote learning policies and strategies for students to benefit. Online learning did not increase the accessibility of university education during the pandemic for students attending marginalised universities. Increasing the accessibility was, in fact, a complex and challenging process that revealed the digital divide among students and different universities.

### Recommendations for Remote Learning when Face to Face is not Possible

Our findings demonstrate the failures of a one size fits all approach to remote learning. Teaching should consider the curriculum, the digital competencies (skills, devices and access) of students, if a module is applied, theoretical or clinical and the class size. Based on our teaching experiences during lockdown at a privileged university, to accommodate marginalised students we recommend the following. The use of PowerPoint Presentations with impactful visuals, case studies, narration and scripts where possible to be shared and engaged with asynchronously. Content must be saved in different formats (e.g. MP4, PowerPoint, Pdf) that can be further compressed into smaller file sizes and made available on different platforms (Blackboard, WhatsApp, Google Drives). Break up content into smaller episode/sessions (15-20 minutes). Synchronous sessions are for questions and clarification. Students can also use email, Blackboard Collaborate, Zoom or WhatsApp groups for the same purpose. Assessments should be used with a combination of short questions and essays that have a strong critical thinking versus testing route learning component. The settings for timed quizzes should consider unstable student connections and be available 24 hours to accommodate the home environment. Take assignments with a research component and submit via a plagiarism checker.

The provision of a multimodal approach in which course content is highly flexible and accessible through multiple media formats for students to choose what is conducive to their learning context. For example, in areas where there is no connectivity, or a university is unable to provide data and devices for all students, they can receive teaching and learning material through post-delivery. If some barriers cannot be addressed in the moment, IHE should have a campus-based 'second-opportunity.'

### Limitations and Further Studies

Despite the novel contributions above, the study has some limitations. We analyzed the tweets with a qualitatively focused interpretative approach which is subjective, other researchers may have different insights. However, we had numerous discussions during our research process to ensure we agreed on the meanings interpreted from the data. We also make our analysis paths as visible as possible. Future studies could expand on these findings and look at management and educators' reaction to emergency online learning during the pandemic.

Future research directions could analyse students' perspectives, experiences, attitudes, and feelings and compare them with other African countries, in order to provide a more comprehensive view of the phenomenon and to attain more detailed results. Research can also focus on lecturer experiences and readiness during the first wave of COVID-19. Our study did not reflect the lecturers' performance and skill barriers during emergency online remote teaching, an opportunity for further studies. One of the limitations of this study is that it is a qualitative inquiry and application of quantitative and statistical analysis of these tweetscould yield more insight into specific characteristics of students that were affected by the digital divide and racial inequalities. Moreover, further studies could also consider a quantitative descriptive survey method to tests some of the findings emerging in this study which relate to historical disadvantaged versus historically privileged institutional disparities. A representative quantitative surveycould follow up on the study to establish how students' experiences may have an impact on drop out or resilience to emergency online remote teaching.

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## REFERENCES

Abdulrahim, H. & Mabrouk, F. (2020). COVID-19 and the Digital Transformation of Saudi Higher Education. Asian Journal of Distance Education, 15(1), 291-306.

Adam, T., Kaye, T., & Haßler, B. (2020). The Maldives and Sri Lanka: Question and Answer Session. (EdTech Hub Helpdesk Response No 18) DOI: 10.5281/zenodo. 3885817. Available under Creative Commons Attribution 4.0 International.

Ahmed, W., Bath, P., & G. Demartini, 2017. Chapter 4 Using Twitter as a Data Source: An Overview of Ethical, Legal, and Methodological Challenges. In: Woodfield, K., (ed.) The Ethics of Online Research. Advances in Research Ethics and Integrity, (2). Emerald, pp. 79-107. ISBN 978-1-78714-486-6.

Aharony, N. (2012). Twitter use by three political leaders: an exploratory analysis. Online Information Review, 36(4), 587-603. doi:10.1108/14684521211254086

Alsaaty, F.M., Carter, E., Abrahams, D., & Alshameri, F. (2016). Traditional Versus Online Learning in Institutions of Higher Education: Minority Business Students' Perceptions. Business and Management Research 5 (2), 31-41.

Auster, C.J. (2016). Blended Learning as a Potentially Winning Combination of Face-to-face and Online Learning: An Exploratory. Study Teaching Sociology, 44(1), 39-48.

Bhaumik, R. (2020). Widening disparities in educational access during COVID-19: A deepening crisis. In Naumovska, L. (ed.). The impact of COVID19 on the international education system. IGNOU, New Delhi, India. DOI: https://doi.org/10.51432/978-1-8381524-0-6_10

Beaunoyer, E., Dupere, S., & Guitton, M.J. (2020). COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. Computers in Human Behavior, 111, 111, 106424.https://doi.org/10.1016/j.chb.2020.

Beninger, A. K., Fry, A., Jago, N., Lepps, H., Nass, L., and H. Silvester. 2014. Research using social media; users views. Natcen social research. http://www.natcen.ac.uk/media/282288/p0639-research-using-social-media-report-final190214.pdf\nhttp://www.natcen.ac.uk.(Accessed 27 November 2020).

Blank, G. (2017). The Digital Divide Among Twitter Users and Its Implications for. Social Research. Social Science Computer Review, 35(6), 679–697.

Bozkurt, A., Jung, I., Xiao, J., Vladimirschi, V., Schuwer, R., Egorov, G., Lambert, S.R.... Paskevicius, M., + (2020). A global outlook to the interruption of education due to COVID-19 Pandemic: Navigating in a time of uncertainty and crisis. Asian Journal of Distance Education, 15 (1) 1-126. 10.5281/zenodo.3878572.

Bozkurt, A., & Sharma, R.C. (2020). Emergency remote teaching in a time of global crisis due to CoronaVirus pandemic. Asian Journal of Distance Education, 15(1), i-vi. https://doi.org/10.5281/zenodo.3778083

Burac, M.A.P., Fernandez, J.M., Cruz, M.M.A., & Cruz, J.D. (2019). Assessing the impact of e-learning system of higher education institution's instructors and students. IOP Conference Series Materials Science and Engineering 482, 1–8.

Christensen, L.L., & Larsen, M.C. (2020). Ethical challenges in digital research: A guide to discuss ethical issues in digital research (2nd ed.). Aalborg Universitet, Digetik, DigHumLab. https://dighumlab.org/wp-content/uploads/2018/10/Ethical_challenges_in_digital-research.pdf

Coman, C., Țiru, L.G., Mesesan-Schmitz, L., Stanciu, C., & Bularca, M.C. (2020). Online Teaching and Learning in Higher Education during the Coronavirus Pandemic: Students' Perspective Sustainability; Basel 12, (24) 10367. DOI:10.3390/su122410367

Czerniewicz, L. (2020). What we learnt from "going online" during university shutdowns in South Africa. Retrieved January 26, 2020 from https://philonedtech.com/what-we-learnt-from-going-online-during-university-shutdowns-in-south-africa/

Czerniewicz, L., Agherdien., N., Badenhorst, J., Belluigi, D., Chambers, T., Chili, M., de Villiers, M., Felix, A., Gachago D., Gokhale, C., Ivala, E., Kramm, N., Madiba, M., Mistri, G., Mgqwashu, E., Pallitt, N., Prinsloo, P., Solomon, K., Strydom, S., Swanepoel, M., Waghid, F., & Wissing, G. (2020). A Wake-Up Call: Equity, Inequality and Covid-19 Emergency Remote Teaching and Learning. Postdigital Science and Education, 2, 946–967 https://doi.org/10.1007/s42438-020-00187-4

Davis, N. (2016). What Is the Fourth Industrial Revolution? World Economic Forum: Geneva, Switzerland. Retrieved October 20, 2020 from https://www.weforum.org/agenda/2016/01/what-is-the-fourth-industrial-revolution/

Dube, B. (2020). Rural Online Learning in the Context of COVID-19 in South Africa: Evoking an Inclusive Education Approach. Multidisciplinary Journal of Educational Research, 10(2), 135-157. doi:10.4471/remie.2020.5607

Duffy, K., & Ney, J. (2015). Exploring the Divides Among Students, Educators, and Practitioners in the Use of Digital Media as a Pedagogical Tool. Journal of Marketing Education, 37(2), 104–113.

Dwivedi, Y. K., Hughes, D. L., Coombs, C., Constantiou, I., Duan, Y., Edwards, J. S., Gupta, B, Lal, B., Misra, S., Prashant, P., Raman, R., Rana, N.P., Sharma, S.K., & Upadhyay, N. (2020). Impact of COVID-19 pandemic on information management research and practice: Transforming education, work and life. International Journal of Information Management, 102211. https://doi.org/10.1016/j.ijinfomgt.2020.102211

Gillett-Swan, J. (2017). The Challenges of Online Learning: Supporting and Engaging the Isolated Learner. Journal of Learning Design, 10(1), 20-30.

Gloria, A.M., & Uttal, L. (2020). Conceptual Considerations in Moving from Face-to-Face to Online Teaching. International Journal on E-Learning, 19(2),139-159.

Guri-Rosenblit, S. (2009). Challenges facing distance education in the 21st century. In U. Bernath, A. Szucs, A. Tait, & M. Vidal (Eds.), Distance and e-learning in transition: Learning innovation, technology and social challenges (pp. 5–22). London, UK: ISTE Ltd.

Hasan, N., & Bao, Y. (2020). Impact of "e-Learning crack-up" perception on psychological distress among college students during COVID-19 pandemic: A mediating role of "fear of academic year loss". Children and Youth Services Review, 118, 1-9.

Hidalgo, A., Gabaly, S., Morales-Alonso, G., & Urueña, A. (2020). The digital divide in light of sustainable development: An approach through advanced machine learning techniques. Technological Forecasting & Social Change, 150(C),1-7. https://doi.org/10.1016/j.techfore.2019.119754

Hodges, C.B., Moore, S., Lockee, B.B., Trust, T., & Bond, M.A. (2020). The Difference Between Emergency Remote Teaching and Online Learning. Retrieved January 27, 2020 from https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Kajee, L., & Balfour, R. (2011). Students' access to digital literacy at a South African university: Privilege and marginalisation. Southern African Linguistics and Applied Language Studies, 29(2), 185–194.

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and Challenges for Teaching Successful Online Courses in Higher Education: A Literature Review. Journal of Educational Technology Systems, 46(1), 4–29.

Lee, K. (2017). Rethinking the accessibility of online higher education: A historical review. The Internet and Higher Education, 33(1), 15–23. DOI: 10.1016/j.iheduc.2017.01

Lombana-Bermudez, A., Cortesi, S., Fieseler, C., Gasser, U., Hasse, A., Newlands, G., & Wu, S. (2020). Youth and the digital economy: Exploring youth practices, motivations, skills, pathways, and value creation. Youth and Media, Berkman Klein Center for Internet & Society. Retrieved October 28, 2020 from https://cyber.harvard.edu/publication/2020/youth-and-digital-economy.

Martínez-Bravo, M-C., Sadaba-Chalezquer, C., & Serrano-Puche, J. (2020). Fifty years of digital literacy studies: A meta-research for interdisciplinary and conceptual convergence. Profesional de la información, 29 (4), 1-16, e290428. https://doi.org/10.3145/epi.2020.jul.28

Mhlanga, D., & Moloi, T. (2020). COVID-19 and the Digital Transformation of Education: What Are We Learning on 4IR in South Africa? Education Science, 10 (180), 1-11.

Mosca, J.B., Curtis, K.P., & Savoth, P.G. (2019). New approaches to learning for generation Z. Journal of Business Diversity, 19(3), 66-74. doi:10.33423/jbd.v19i3.2214

Mpungose, C.B. (2020). Emergent transition from face-to-face to online learning in a South African University in the context of the Coronavirus pandemic. Humanities and social sciences communications, 7(113), 1-9.

Mzangwa, S. T. (2019). The effects of higher education policy on transformation in post-apartheid South Africa, Cogent Education, 6(1), 1592737.

Odit-Dookhan, K. (2018). Attitude towards e-learning: The case of mauritian students in public teis. PEOPLE International Journal Social Science, 4, 628–643.

Oke, A., & Fernandes, F.A.P. (2020). Innovations in Teaching and Learning: Exploring the Perceptions of the Education Sector on the 4th Industrial Revolution (4IR). Journal of Open Innovation, 68 (2), 31-54.

Outhwaite, L. (2020). Inequalities in Resources in the Home Learning Environment (No. 2). Centre for Education Policyand Equalising Opportunities. London, UK: UCL Institute of Education.

Owusu-Fordjour, C., Koomson, C.K., & Hanson, D. (2020). The impact of Covid-19 on learning-the perspective of the Ghanaian student. European Journal of Education Studies, 7 (3), 88-101. doi: http://dx.doi.org/10.46827/ejes.v0i0.3000.

Palvia, S., Aeron, P., Gupta, P., Mahapatra, D., Parida, R., Rosnera, R., & Sindhi, S. (2018). Online Education: Worldwide Status, Challenges, Trends, and Implications. Journal of Global Information Technology Management, 21(4),233–241. https://doi.org/10.1080/1097198X.2018.1542262

Priyadarshini, A., & Bhaumik, R. (2020). E-readiness of Senior School Learners to Online Learning Transition amid COVID-19 Lockdown. Asian Journal of Distance Education, 15(1), 244-256. Retrieved from http://asianjde.org/ojs/index.php/AsianJDE/article/view/456

Radha, R., Mahalakshmi, K., Kumar, V.S., & Saravanakumar, A.R. (2020). E-Learning during Lockdown of Covid-19 Pandemic: A Global Perspective. International Journal of Control and Automation, 13(4),1088-1099.

Ramsetty, A., & Adams, C. (2020). Impact of the digital divide in the age of COVID-19. Journal of the American Medical Informatics Association, 27(7), 1147-1148.

Reedy, K., & Parker, J. (eds.) (2018). Digital Literacy Unpacked. London: Facet Publishing. (pp. 63-82)

Reilly, J., Gallagher-Lepak S., & Killion, C. (2017). E-learning in higher education: The digital divide and culture. Journal of Current Issues in Media and Telecommunications, 9(1), 1-14.

Soomro, K.A., Kale, U., Curtis, R., Akcaoglu, M., & Bernstein, M. (2020). Digital divide among higher education faculty. International Journal of Educational Technology in Higher Education, 17(21), 1-16.

Takalani, T. (2008). Barriers to e-learning amongst postgraduate Black students in higher education in South Africa. Masters dissertation, Stellenbosch University.

Takavarasha, S., Cilliers, L., & Chinyamurindi, W., (2018). 'Navigating the unbeaten track from digital literacy to digital citizenship: A case of university students in South Africa's Eastern Cape province'. Reading & Writing, 9(1), 1-15. a187. https://doi.org/ 10.4102/rw.v9i1.187

Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies and practices: Digital technologies and distance education during the coronavirus emergency. Learning, Media and Technology, 45(2), 107–114. https://doi.org/10.1080/17439884.2020.1761641.

Worley, W.L., & Tesdell, L.S. (2009). Instructor time and effort in online and face-to-face teaching: Lessons learned. IEEE Transactions on Professional Communication, 52(2), 138.

Yen, T.-F. T. (2020). The performance of online teaching for flipped classroom based on COVID-19 aspect. Asian Journal of Education and Social Studies, 8(3), 57–64.

Yu, E., & Canton, S. (2020). Student-inspired optimal design of online learning for generation Z. Journal of Educators Online, 17(1), 1-11.

Zhou, L., Wu, S., Zhou, M., & Li, F. (2020). 'School's Out, But Class' On', The Largest Online Education in the World Today: Taking China's Practical Exploration During The COVID-19 Epidemic Prevention and Control as an Example. Best Evidence Chinese Education, 4(2), 501-519. DOI https://doi.org/10.15354/bece.20.ar023.

# IMPLEMENTING FLIPPED CLASSROOM MODEL IN DEVELOPING BASIC LANGUAGE ARTS OF THE FOURTH GRADE STUDENTS

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## ABSTRACT

This study aims to examine the role of the Flipped Classroom Model (FCM) in the development of the basic language skills of 4th grade students in Turkish language lesson. In this respect, in the 4th grade Turkish language lesson in which the FCM was used, the views of fourth-grade students, their teachers, and parents related to the circumstances and process occurred during the implementation of the FCM in improving the basic language skills of students were investigated. The study was designed in the action research. The study was conducted with thirteen activities in the fourth grade Turkish language lesson and lasted nine weeks and 45 course hours. Data were collected from observations, interviews, documents, action plans, learning materials and validation committee meeting decisions. According to results the activities carried out during the implementation contributed to the development of language skills of the students. It was also seemed that students' various cognitive, affective, psychomotor and social skills developed, that improvements happened in terms of classroom management, and that behavioral problems which affect the implementation process decreased. In addition, students, their teachers and parents were observed to have positive opinions regarding the FCM and the implementation process.

**Keywords:** Flipped Classroom Model, language arts, basic language skills, Turkish language teaching, mother tongue education, technology integration.

## INTRODUCTION

Regarding the development of a country, focus is generally on education and economic development. However, the use of language is not mentioned (Zulfikar, 2011). Some mother language-related circumstances can be considered as the most important indicators of the development level of a country, such as the development of language skills of individuals living in the country, the ability to use their skills, vocabularies, expressing themselves, and in-depth understanding. Therefore, societies need people whose mother language has developed because individuals using mother tongue competently have mental competence in terms of healthier, richer, more critical and in-depth thinking skills (Karaduz, 2016).

While mother tongue education is a process that starts with the birth of the individual, this task is officially undertaken by the Turkish language lessons in school period. Accordingly, Turkish language lessons play a pioneering role in using students' receptive and expressive skills. Mother tongue includes listening, speaking, reading and writing skills. These skills are closely related, since in real life, they are not used separately but together (Brown, 2007). A development in one of the one of them affects other skills in that direction (Gunes, 2009; Demirel & Sahinel, 2006). In this respect, it can be said that Turkish language lesson is the basis of other lessons and individuals who are not competent in their mother tongue will have difficulty in other lessons (Guneyli, 2007). Therefore, there is a significant relationship between Turkish language lesson (mother tongue lesson) and other lessons (Bloom 1995; Ural & Ulper, 2013; Bayat, Sekercioglu & Bakir, 2014; Sever, 2011; Ceran & Deniz, 2015). In studies on this subject, although emphasis has been placed on education councils and curriculums prepared to date, it is observed that the students do not show sufficient success in national and international exams (Acar, 2012; Akbaba-Altun, 2009; Bozkurt, 2016). In this context the subject of Turkish instruction (mother tongue education, language arts education) emerges as one of the problems waiting to be solved at all levels.

Some problems mentioned are not considering the individual differences of the students, crowded classes, insufficient time for in-class activities and inadequate activities, low quality of textbooks, teachers' use of materials, their teaching methods and lack of knowledge and skills related to assessment, pre-service and in-service training (Taskaya & Musta, 2008; Girmen, Kaya & Bayrak, 2010; Demircan & Inandi, 2008; Kirmizi & Akkaya, 2009). It is noteworthy that there are quite a lot of grammar in the graduate theses in the field of Turkish instruction in the national framework. Studies on language skills are less compared to other subjects, especially in listening and speaking (Yagmur Sahin, Kana & Varisoglu, 2013; Varisoglu, Sahin & Goktas, 2013).

It can be claimed that e-learning will enrich the teaching of mother language thanks to the structure of e-learning processes, providing opportunities for multifaceted and interactive environments, addressing individual characteristics, facilitating learning, and creating a natural interaction environment (Ulas, 2002; Peregoy & Boyle, 2012). E-learning environments, in the simplest sense, allow for multimedia that brings together of components such as text, graphics, sound and video in a computer environment and their digital presentation (Ongoz, Aydin & Aksoy, 2016. Thus, multimedia; It is stated that, due to its structure, it can provide effective learning in terms of preparing the ground for participatory and active learning, appealing to different senses, facilitating learning, having a high level of interaction, being flexible and addressing individual differences (Katirci, 2010; Kilic, 2006; Rogers, 2001). Therefore, it can be thought that e-learning processes can enrich Turkish instruction.

Consequently, considering the place and importance of technology in terms of individuals and societies, it is natural to state that technology and language teaching should be brought together (Ozdemir, 2017). In order to make use of technology more systematic and planned, it is vital to include technology-based models, methods and techniques. Therefore, the FCM, which combines in-class and out-of-class teaching-learning processes in a complementary and systematic manner, is one of the models that have gained importance in recent years (Rossi, 2014; Tosun, 2017).

According to the FCM, the teaching-learning process is divided into two processes: in-class and out-of-class. In other words, the FCM systematically combines in-class and out-of-class teaching-learning processes in a supportive, complementary and cyclical way. Thus, the FCM turns the traditional learning experience on its head by asking students to do traditional in-class activities at home, and traditional homework activities at class. In this process the student watches the videos prepared by the teacher, takes notes, prepares questions and completes activities, and comes to school ready for learning preparedly. The teacher checks the student participation online. In the classroom, the teacher provides tasks and learning circumstances that are based on individual or group works in which students can put theory into practice and where they can join the process creatively (Bergmann & Sams, 2012; Bergmann & Sams, 2016; Lage, Platt & Treglia, 2000). In the FCM, students can control their own learning process without time and space limitation in line with their individual differences, needs and speeds, while they are active and play a more interactive role with others in classroom activities (Carbaugh & Doubet, 2015; O'Flaherty & Philips, 2015) (Figure 1).

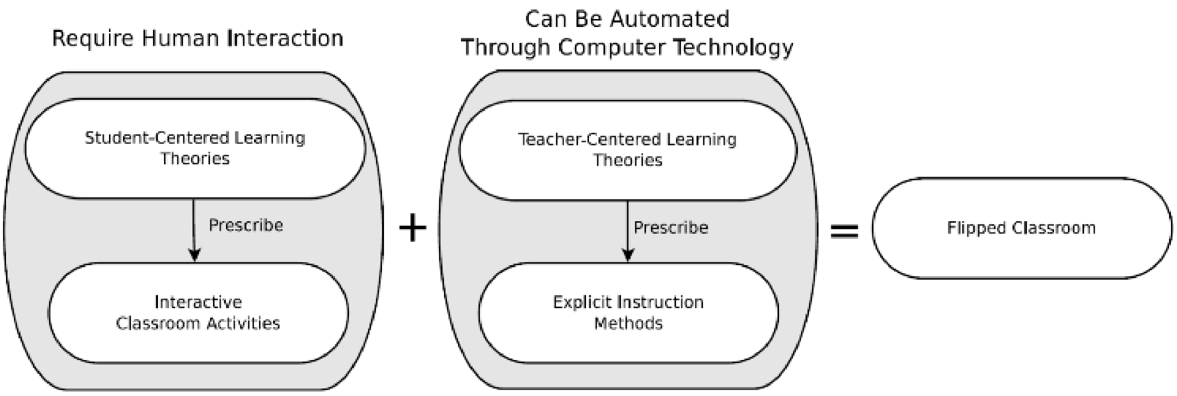


**Figure 1.** Flipped Classroom Model (Bishop & Verleger, 2013, p. 6)

According to Flipped Learning Network (FLN, 2014), the FCM has four main components. The acronym "F-L-I-P" refers to the initials letters of the components: Flexible Environments, Learning Culture, Intentional Content and Professional Educator. Flexible Environments brings the process under control with the help of technology by taking the teaching-learning processes to the out of the classroom. Thus, on the one hand, there is a large and flexible virtual environment created by technology outside the classroom, while on the other hand a physical and wide flexible environment created by information and / or text-based content in the classroom occurs. Learning Culture includes behavioural systematic such as the education stakeholders know how, when, and in what type of activities the components of the process will act; they know which topic wil be taught and how to teach it; they know how a problem will be solved. Therefore, all the components of the class create a learning culture with its own characteristics and variables. Intentional Content includes various learning contents and materials prepared by educators to make the process more efficient depending on subject area and student's circumstances. Professional Educator is the most important component of the FCM. Even though professional educators seem to have fewer roles in the classroom, they are those who prepare and follow in-class and out-of-class teaching-learning processes, who observe students and follow their development, who provide immediate feedback and evaluate works.

## FCM AND BASIC LANGUAGE SKILLS

Turkish (mother tongue) language lessons include studies based on reading text or listening; speaking and writing; verbal or nonverbal receptive and expressive language skills, studies based on relevant language skills and vocabulary, and studies based on teaching of grammar in terms of education level. Accordingly, Turkish language is a skill-based course since it aims to have students use their mother tongue effectively in their daily and future academic life.

The skill-based structure of the Turkish language lesson contains the processing of basic language skills, vocabulary and grammar based on a text (reading, listening, watching -such as film, animations and cartoons- text) related to the theme in primary school. Hence, the Turkish language lesson can be divided into various dimensions in terms of the FCM (i) reading, listening or watching the text; (ii) processes such as language arts, enrichment of vocabulary and teaching of grammar subjects. Thus, in a Turkish language lesson it may be appropriate to perform some activities based on the FCM at home such as reading, listening or watching a text, general superficial studies about language arts, instructional grammar content, superficial vocabulary studies and simple task such as research of subject content. At the same time, it may be appropriate to perform some activities such as activities related to the text and based on speaking and writing skills, practice-based activities related to grammar and vocabulary in-class. In addition, the teacher's ability to follow and monitor the student participation of homework activities before the class time, observe how much the subject/text is understood, use non-adaptive original formats of texts can contribute to the process of Turkish language teaching (Bergmann & Sams, 2012, 2014).

Considering the Turkish language lessons, since reading and listening take a lot of time, it can be said that in-class time can be quite broad. A great attention could be paid for speaking and writing skills that were neglected before due to lack of time (Pasisis, 2015). In this context, as the process of teaching Turkish language is not a one-dimensional knowledge and skill area but it includes multi-faceted and complex activities (Sever, 2011), it allows the use of texts of sufficient length in their original form that will develop the students' language awareness.

In addition to this, regarding texts or skills, there can be long-term group works, games, theatrical activities, visual and audio studies, and interdisciplinary studies (Gunes, 2012). Therefore, there is a need for models that effectively combine in-class and out-of-class processes during the process of Turkish language teaching –and the development of language skills. In this respect, the FCM has the potential to be applied in Turkish language lesson due to its nature. Thus, it can be assumed that students' language skills can be improved by using the FCM in Turkish language lesson.

## THE AIM OF THE STUDY

There are many FCM-related studies conducted on various disciplines in different education levels. Literature generally provides studies on science and mathematics (Johansen & Cherry-Paul, 2016). Considering language, researches have mainly focused on teaching a language as a foreign language (Basal, 2012; Ekmekci, 2017; Hung, 2015; Temizyurek & Unlu, 2015). However, it can be said that there are few studies on mother language skills (Cockrum, 2017; Moran, 2014; Moran, 2018). Studies reveal that the FCM generally can play a role in the development of language skills (Basal, 2015). In addition, studies related to the FCM were usually conducted at university level and fewer studies can be found as the education level decreases (high, secondary or primary school levels) (Johansen & Cherry-Paul, 2016). In this respect, it is important to conduct research on the primary school level.

Considering the problems, circumstances and potentials of the population, lesson and FCM, it can be said that there is a need for operational researches in which new technology assisted/based learning approaches are put into teaching-learning environments actively and in a qualified manner. In this context, for the Turkish language lesson, the use of the FCM was preferred in the research. Because it includes a process in which in-class and out-of-class teaching-learning environments are designed, technological tools are put to work, e-learning contents are prepared, student-teacher-parent interaction is ensured, and student development can be followed easily. With the use of the model in the process, it can be thought that the students' use of digital technologies in the learning process and the involvement of parents in the teaching-learning environment outside of the classroom will increase the student's motivation and thus success. Finally, the FCM can be used in different disciplines, contribute to various educational processes and development of language skills. Hence this study is developed based on the above reasons. So, the aim of this study is to examine the role of the FCM in the development of the basic language skills of 4th grade students in Turkish language lesson. In order to achieve this aim, the following research questions were asked:

- What are the situations related to the implementation of the FCM during the process of developing the basic language skills of the students in the 4th grade Turkish language lesson in which the model was used?
- What are the views of 4th grade students, their teachers, and parents about the implementation of the FCM?

## METHOD

The design of this study is action research. Considering education, action research refers to a systematic research which is conducted by the teacher-researchers, school principals, school counsellors or other stakeholders of the teaching and learning environment and in which the information is gathered to reveal how the school works, how teaching is done and how students learn better (Mills, 2003). Therefore, it can be said that the action research process is not only a "research" but also a broad activity process that includes "research, description, definition, improvement and development". The action research process has its own internal control system. In this respect, it refers to the process includes implementing the action plans, reviewing, correcting and reimplementing. This situation continues in a flexible and cyclical structure until it is saturated. In this way, it gives the researcher the opportunity to access all the details in the process.

Action research was utilized in this study, because it aims to define and describe the circumstances that occur during the process of improving the basic language skills of 4th grade students in Turkish language lesson via the FCM, and to find solutions to the possible problems during implementation. In this study, the action research method was preferred because instead of focusing on certain variables in the development of basic language skills, it was aimed to reach the relevant variables and structures by observing the natural environment of the process and examining it in depth.

The FCM-based action plans implemented during the action research process of this study consist of two dimensions: out-of-class learning processes that were defined as home activities and in-class learning processes. In the first dimension, out-of-class learning processes were conducted and managed through technological components. In this respect, it was seen necessary to prepare a website in which e-content was prepared in different formats (text, video, audio, visual) could be presented, student responses could be collected, and student participation could be followed. Therefore, instead of preparing a paid and specialized website, the researcher preferred creating a free website in which everyone could produce contents.

The e-content on the website was presented through Google Forms which required a Gmail account. The Google Forms interface is simple, straightforward and free from different stimuli, such as the student's logging into the activity, completing the content in the desired order, and finally logging out after sending the answers. Thus, in order to be suitable for the primary school students, a simple design was preferred. When the time came, the activities on the website were activated and the students were informed. The activity guidelines, structured diaries, texts, and contents prepared on Google Forms were presented on separate pages, and students were required to complete all the relevant sections to go to the next page.

In-class learning processes that constituted the second dimension of the action plans included activities such as in- class speeches, discussions, games, role plays and puppet theatre. While selecting the texts in accordance with the themes of Turkish language lesson, some features were taken into account, such as quality, diversity, content and use of language, compliance with the relevant age level, and diversity of Turkish and World Literature. It included different digital forms of the texts such as reading (written text, video reading text), monitoring (cartoon, documentary, digital story), listening (listening text in audio format) and visual (picture, cartoon, comic book). In text-based action plans, language skills, technological abundance (digital story) and manual skills (puppet and visual preparation) were used both together and separately.

These activities were organized as individual and group activities so that students could be active in the classroom. Individual or group products of the students such as posters, written texts, slogans, posters, pictures, digital stories, and digital products were collected and analyzed in each lesson and they were used as direct quotes to support the findings. In activities carried out every week, an attention was given to this diversity to attract students' attention and interest, increase their participation and prevent them from getting bored with the texts and activities. Thus, the variety of activities was considered to contribute positively to the students' development in different skill areas (Gerber, Cavallo & Marek, 2001).

The researcher presented the prepared action plans, texts and website to the opinions of experts consisting of two associate professors specialized in Turkish language and classroom teaching and one assistant professor specialized in computer and teaching technology. Accordingly, necessary revisions were made in accordance with their feedback. Then, the researcher conducted a pilot study with the fourth grade students of a private school and a public school with a middle socioeconomic level. The pilot process includes 10-day pilot implementation process, and 30 lesson hours in-class observation before the actual implementation. In and after running the piloting and observation processes, the action plans were tested if the process and activities are appropriate for 4$^{th}$ grade students and their living. According to the results, the action plans were revised. Also, it was aimed to determine the circumstances and problems of students' basic language skills and technology use in Turkish language lesson in terms of the FCM and research questions. Finally, the actual implementation process was carried out. Research permissions were obtained from Governorship, Directorate of National Education, school administration, teachers, students, and parents.

## Process

This study was conducted with 4th grade students (4/C class) in a state school in Eskisehir in the fall semester of 2016-2017 academic year and it lasted 9 weeks and 45 course hours. Every week, action plans were implemented and the data were collected in Turkish language lessons. Two semi-structured interviews were conducted with the students at the end of the second and ninth weeks. Parents were asked to write their views both in the middle and at end of the process. The parents were asked for their opinions about the students and the implication process on various topics such as the situations at home, fulfilling their duties, the details they reflect from school to home about the lesson and the process, the situations of doing homework. Because they observed the out-of-school life of the students. Two interviews were conducted with the teacher: the first one was before the application, focusing on the personal, family and academic status of the students while the second interview was at the end of the application and it was about the whole process. And the lessons were processed according to the action plans prepared by the researcher.

The validity committee, which was established in order to provide support for the implementations and contributions of action plans, problems encountered and solution suggestions, researcher and student behaviors during the implementation process, convened a total of four times every two weeks. In this process, lessons were taught according to action plans prepared by the researcher within the scope of the study and action plans were reviewed in line with the recommendations of the data and validity committee and classroom observations. The students' completing home activities was monitored independently of time and place; observations were done during in-class courses with camera; researcher and student wrote diaries; stakeholders (students, teachers and parents) were interviewed; students learning products were collected.

## Participants

In this study, criterion sampling was applied. Criterion sampling takes the basis of studying all situations with various predetermined criteria (Yildirim & Simsek, 2008). The criterion was that student needed to have at least one device (e.g. desktop, laptop, tablet computer, smartphone) and wired, wireless or mobile internet access at home. In this context the students used different devices in the process. Whether this difference affects the process has not been measured. Because no application, software or content requiring high level technical features were used. However, in case of technical problems of the students, the problems were solved in a short time by contacting the researcher instantly. The sample consisted of 23 fourth grade students (11 males and 12 females), their teacher and parents. The teacher of the class had a 22-year professional experience. As the researcher carried out the implementation process, the class teacher took an observer role. Sitting at the back of the classroom, he observed the lesson process and helped the researcher and made recommendations when necessary. So, the teacher was not trained about the use of the FCM. Most of the students had middle and upper-middle socioeconomic status. A male student in the class has an ADHD (attention deficit and hyperactivity disorder) report. According to the class teacher, another male student was younger than others, so he did not have the same level of development and characteristics, while two girls had learning difficulties. However, the researcher included these students in the study, as they were an element of the natural environment of the class and as he wanted to observe how these students were possibly affected from the implementation process. It was examined how the application in this heterogeneous class could bring about a process for different students.

## Data Collection Tools

Action research requires multiple data collection methods since it is process-oriented and usually takes a long time to collect data for the focused problem (Yildirim & Simsek, 2008). Thus, various data collection tools were utilized such as observations, interviews, documents (student diaries, researcher diary, and student products), action plans, learning materials and validation committee meeting decisions.

In the current work, the researcher took part as a participant observer. Since the researcher was not able to take field notes due to being a practitioner in the process, in-class applications were recorded with the help of video cameras in order to avoid data loss. After the lessons, in his diary, the researcher reflected his views, comments and feelings about the situations he encountered during the observation process. During the lessons, the researcher took notes and expanded his observations by comparing his diaries during the video casting. Within the study process, students kept diaries to reflect their feelings and thoughts about home activities, e-content presented in digital media, in-class activities. These feedbacks were collected every day as structured diaries through website.

Students' responses to digital texts, educational videos and e-learning contents at home activities in the digital learning environment were collected as student products during the process. In-class activities consisted of individual or group presentations such as writing works, poster, banner, visual creation, slogan, role play, drama, puppet theatre, digital story.

A validity committee was established in order to provide support to the researcher regarding some issuessuch as the feasibility and contribution of action plans in the study process, problems encountered and their solutions, and researcher and student behaviours. The committee consisted of one associate professor specialized in the field of Turkish language and classroom teaching, one associate professor specialized in the field of classroom teaching and action research, one associate professor specialized in the field of classroom teaching and Turkish language teaching, and one assistant professor specialized in the field of classroom teaching, qualitative research methods, and social studies. During the study process, validity committee meetings were held at approximately two-week intervals and a total of four meetings were held. During these meetings, the researcher took notes and recorded them as meeting decisions. After the studies, the researcher reviewed the action plans and carried out the implementation process.

The views of students, teachers and parents were interviewed in this study. Students were interviewed twice with using semi-structured interviews. Moreover, two semi-structured interviews were conducted with the teacher. Because reaching, visiting and interviewing with the 23 parents was so hard, written opinions were collected twice through open-ended questionnaires. The reason for this is to be able to follow and identify the status and problems of the implementation process with the opinions of different participant types, and at the same time, to apply their opinions in order to make necessary arrangements regarding the problematic parts. Semi-structured interviews were recorded via voice recorders and transferred to computer environment by the researcher. The data were then analysed using the Nvivo8 program. The researcher consulted with an associate professor and an assistant professor (specialized in the field of basic education, Turkish language teaching, qualitative research methods, action research and educational sciences) for semi-structured interview forms and open-ended questionnaires. Necessary revisions were in line with experts' feedback and a semi-structured interview was piloted with three students. Questions were examined in terms of intelligibility and the possible problems were determined. Then, as a final step, the researcher made the necessary revisions and submitted the forms to the validity committee.

## Data Analysis

Content analysis was used to analyse the data obtained from the interviews of students, their teacher and parents. Content analysis is based on the processing of information that a particular message covers and carries (Bilgin, 2006). The starting point is shaped according to the purpose of the research. In the content analysis, at first the categories are created, then the data are coded according to these categories (Elo & Kyngas, 2008). In this context, interviews were transcribed and new categories and codes emerged by the help of Nvivo8 program. Then, the researcher classified the direct quotations according to categories and codes and interpreted the data.

Descriptive analysis was used to analyse the data collected from observations, students products, diaries, and researcher notes. The data of the descriptive analysis are summarized and interpreted according to the previously determined themes. Direct quotations are included to conspicuously reflect the views of the individuals interviewed or observed. The following stages are followed within the scope of descriptive analysis: creating a framework for descriptive analysis, processing data according to thematic framework, defining the findings, and interpreting the findings (Yildirim & Simsek, 2008). Accordingly, the data were classified according to the circumstances and problems affecting language skills and the development of language skills and the related notes were taken.

In this study, the data collected were arranged in a meaningful and logical holistic way. For example, in a puppet theatre event that included stages of writing and presenting the text, the process of students' writing the text (writing, punctuation, use of story items) was handled under the skill of writing while the presentation phase (the prepared puppet, tone of voice, use of visual elements) was handled under the skill of visual presentation. Direct quotations from observations, interviews, student products, and student and researcher diaries were used to support the findings of the study. Furthermore, the data were defined and explained in a reader friendly way.

### Validity, Reliability and Ethics

In qualitative research, credibility (accuracy, dependability) refers to observing and transmitting data as neutral as possible (Kirk & Miller, 1986). Transferability (confirmability) means that similar situations can be experienced rather than generalizing the findings and results to other situations (Yildirim & Simsek, 2008). In this study, necessary permits were obtained from institutions, students, teachers and parents. The views of the validity committee and field experts were consulted for the action plans, interview forms, e-learning contents and the suitability of the materials, and the necessary revisions were made in line with the recommendations. The researcher tried to guarantee data diversity by gathering data from different sources while the data were investigated by the researchers separately in order to ensure researcher diversity. The data were presented to the validity committee that met at regular intervals and their expert opinions were obtained. Thus, the reliability of the study was aimed to be high. To help the readers visualize the research context in mind, detailed descriptions and direct quotations are included in the presentation of the findings regarding the transferability of the study. Therefore, it can be said that the results of this research are applicable in the classes with the same or better conditions. In this context, the aim was to increase the level of transferability of the study.

In addition, it was cared protecting the physical, mental health and happiness of the participants, and ensuring the conformity of the research with ethical values in terms of scientificity in the study. In this context, (i) necessary official permissions for the research environment and participants were obtained. (ii) Participants (students, parents and classroom teacher) were informed about the research and written and verbal consent was obtained that they voluntarily participated in the research. (iii) The participant information was hidden in the presentation of the findings, the faces were blurred in the images and the nicknames were used instead of the real names. (iv) The data were shared with the participants and interested parties when necessary. (v) Research data was used only in this research. As a result, it can be claimed that the researcher behaved within the ethical rules during the research and conducted the research in accordance with the ethical rules.

## FINDINGS

### Findings Related to Basic Language Skills

Considering the themes included in the curriculum, 13 activities based on the FCM were implemented. The texts used in this framework are prepared in different genres (fairy tales, stories, cartoons, animated films, poems) and digital formats (reading text, listening text, video). Additionally, the instructional contents were presented by videotaping. It was aimed to improve basic language skills in a holistic manner during the activities and the activities were designed to address multiple language skills. Vocabulary and grammar were developed in various ways during activities. During activities, some other cognitive, affective, dynamic, social and technology skills as well as language skills were developed.

**Table 1.** Activity A: Dede Korkut

| | | | | |
|---|---|---|---|---|
| Activity A1 | At home | 7-8-9 October | Preparation | - Students were asked to watch the first chapter of the cartoon (Dede Korkut Stories). https://www.youtube.com/watch?v=CCEHs0pXqHk<br>- Then, students were asked to answer text-based questions |
| | At school | 10 October | Introduction | - Students talked about the videos they watched, and their thoughts were collected. |
| | | | Teaching-learning process | - Students were divided into two groups and asked to write their predictions about the continuation of the story. |
| | | | Evaluation | - Student writings were evaluated. |
| Activity A2 | At home | 10-11 October | Preparation | - Students were asked to watch the other selected chapters of the cartoon (Dede Korkut Stories). https://www.youtube.com/watch?v=VFKVtngWXiU<br>- They were asked to note the words they did not know. |
| | At school | 12 October | Introduction | - Students talked about the videos they watched and their thoughts were applied. |
| | | | Teaching-learning process | - Students were asked the words they did not know.<br>- Students were informed about how to search the meaning of the words from the Turkish Language Institution website and what to look for when searching information on the Internet |
| | | | Evaluation | - Students were asked to determine the values in the text and to write outcomes from the text about these values.<br>- There was a writing slogan activity related to the subject. |

Students' skills in using technology, accessing reliable and accurate information, and using secure internet were developed through digital media, which is the other pillar of the FCM and in which the home activities were completed. Moreover, after each activity, students' views about the activity, text and / or contents used were asked. Thus, problems in the process of action research were minimized. An example of the implementation plan of an activity can be seen in Table 1.

Table 2, presents the contents of all the activities, the type and digital format of texts used, what was done during the activity process, and related language skills. In Table 2, it is seen that the students' multiple language skills were developed. In addition to the language skills, improvement was observed in various outcomes, such as social, technology use, imagination, discussion, estimation and appreciation. For example, as the activity progresses, it was noted that; the capability to use language skills was developed (Activity K); the quality and quantity of texts were improved in writing skills (Activity J, K). In terms of speaking skills, the fear of speaking in public decreased while responsibility and motivation increased (Activity L, M); qualifications, subject matter and remarkable contents were handled considering visual presentation (self-expression with visual), imagination, creativity (Activity H, K). Also, there were developments in theatrical skills (Activity M); and also learning increased and misuses reduced in grammar. In addition, considering working culture and group work, it was seen that the students worked in harmony, that the quality and quantity characteristics of the products improved, that skills such as not disturbing others improved, and that problematic behaviours decreased in group writing, product creation or game-based activities (Activity E, H, K, N) (Appendix 1). Related examples are presented in Appendix 1.

**Table 2.** Contents of all activities

| Name of Activity | Text type | Content format | Activity content, what has been done | Group/ individual | Related language skills |
|---|---|---|---|---|---|
| Activity A | Cartoon, Saga | Video | Group writing, vocabulary, understanding and analysis of text, slogan writing, visual creation, reliable sources of information and internet usage | Group, Individual | Monitoring, speaking, writing, vocabulary, grammar |
| Activity B | Story | Listening | Writing a title for text, understanding and analysis of text, visual creation and written expression of visual, puzzle | Individual | Listening, writing, vocabulary, visual presentation |
| Activity C | Tale | Reading | Predicting content by image, understanding text and vocabulary studies, role playing (writing and presenting), playing games | Group | Reading, visual reading, writing, visual presentation, speaking |
| Activity D | Theatre | Video | Understanding and analysing text, writing texts, puppet theatre | Group | Visual reading and presentation, monitoring, writing, speech |
| Activity E | Instructional content | Video | Instructional content, reinforcing the topic | Individual | Language and meaning |
| Activity F | Tale | Listening | Understanding and analysing text, writing, speaking, visual presentation, digital story preparation, vocabulary | Individual | Listening, writing, speaking, visual presentation, vocabulary |
| Activity G | Instructional content | Video | Instructional content, reinforcing the topic, playing game | Individual | Grammar |
| Activity H | Comic book | Reading | Reading, understanding and analysing text, writing, visual presentation | Group | Reading, writing, visual presentation |
| Activity J | Animation movie | Video | Monitoring, understanding and analysing text, cup game (preparing songs) | Group, Individual | Monitoring, auditory presentation, writing |
| Activity K | Story, instructional content | Listening | Listening, understanding and analysing text, instructional content, reinforcing the topic, visual creation and written expression | Individual | Listening, visual presentation, grammar |
| Activity L | Documentary | Video | Monitoring, vocabulary, understanding and analysing text, national park creation and presentation, researching and writing, peer review | Group | Monitoring, vocabulary, visual presentation, writing, speaking |
| Activity M | Animation, instructional content | Video | Monitoring, grammar, understanding and analysing text, drama, reliable sources of information and internet usage | Individual Group | Monitoring, grammar, visual presentation, technology literacy |
| Activity N | Instructional content | Video | Instructional content, reinforcing the topic, playing game | Group | Grammar |

## Views of Participants

### Views of Parents

The researcher used two written form procedures in order to gather the views of the parents who observed their children during out-of-school processes. The first form was filled by 19 parents, while the second form was completed by 20 parents. The researcher analysed data using content analysis. Data from both interviews were combined to be presented under various codes and categories here (Figure 2). It was seen that all parents (except one) had positive views of the FCM. Thus, it can be stated that the FCM served the purpose for contributing to students from different perspectives, creating positive attitudes towards Turkish language lesson, providing effective use of technology, and handling the term "doing homework" in a different way.

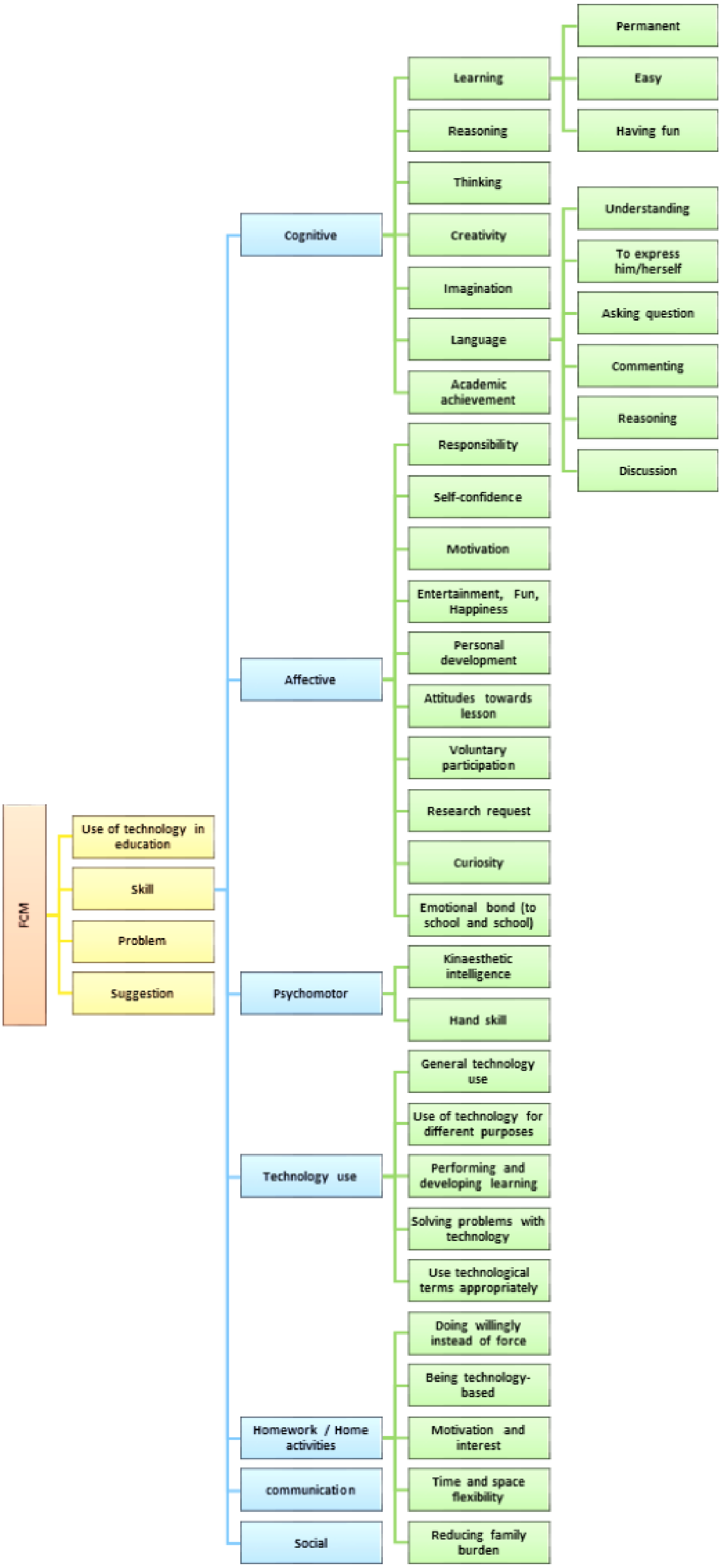


**Figure 2.** Codes and categories obtained from the views of parents

Considering the use of technology in education, parents stated that children's use of technology enhanced, that children had a useful and effective time with technology, and that the use of technology in education would be beneficial even for parents. Almost all of the parents approved the positive effects of the FCM-based activities on students. In addition, it was emphasized that students' cognitive, affective, dynamic, language-communication, social, group work, and technology use skills developed; that there became changes in their behaviours in school, family and social life; that the rate of their participation in classroom activities and homework increased. In addition, parents of students in the disadvantaged group stated that the social skills and behaviours of their children developed as they were often with friends and they partly got over their introversion.

Considering the home activities that were the pillars of the FCM, parents indicated that the students (who did not use to do homework, who did not want to do it, and who pretexted for not doing it) did their homework willingly and entertaining entertainingly without getting bored anymore; that technology motivated students to do their homework; that students could do their homework at home, on the road, in the park as technology provides opportunities to study independent from time and place; and that it also contributed to the students in the disadvantaged group.

> ***Beren****: During the activities at home, I have observed that my daughter is trying to understand what she is watching. She is trying to watch it over and over again and comment on the subject. When we watch the activities together, she finds errors in my comments. In a nutshell, she can see what she looks at, she can understand what she sees, she can question what she understands, she can express what she questions.*
>
> ***Dilek (disadvantaged)****: We observe positive changes in school, family and social life. She communicates more easily in her dialogues in the family. She uses words and sentences better. While doing homework, she understands the questions. She has a better communication with her friends.*
>
> ***Eda****: Thanks to this implementation, homework has turned into fun rather than being considered as duty or responsibility. She does homework without getting bored and feeling under pressure. The use of tablet or phone makes life quite easy because using tablet and earphones reduces the working pressure helps students enjoy the homework since it makes it possible to do homework on the road and in the park… To sum up, I am of the opinion that your effort to teach lesson in a play and entertainment environment provides success for my daughter and my family.*
>
> ***Elcin****: First of all, she enjoys the activities you give in the course. She's looking forward to being in your lessons. Every new activity you share arouses my daughter's curiosity. My daughter is happy as she does not have to do desk-based. She does responsibilities with a "great pleasure", instead of considering it as a "must".*
>
> ***Erhan****: When I and my son evaluate in-class and home activities, he indicates that they are permanent, effective, and full of fun… I believe that this new approach and methods will provide higher efficiency in education. I think it is a training model that makes the student active and realize what they have learned... In contrast to the monotone lessons, my son both learns and develops what he learns and makes the learning permanent for life thanks to this implementation. He is willing to do the activities instead of considering it as a must. He explores and develops many skills, including technology, imagination, and many verbal-linguistic- kinaesthetic intelligences. He can express himself comfortably as his self-confidence increased in social life… Now, we are optimistic towards computers and mobile phones. This implementation has even changed our attitudes towards technology (the Internet, computer)*
>
> ***Gokalp****: Although my son is a child doing his homework all the time, he becomes more willing to do the lessons with technology. He loves your activities very much and wants to complete them immediately. At the beginning of the process, I used to believe that he would have used your lessons as a means of playing Internet games. I checked him many times to learn whether he plays games or does activities. I always found him studying. His interest of Internet games lessened. He has become more harmonious at home. No pressure and restrictions. You have educated us too. He is more willing to go to school. I wish all lessons were conducted in this way, neither would children be bored from school nor we would have problems. Can you offer this model to the Ministry of National Education for all courses?*
>
> ***Tarik****: Thanks to activities, we have observed various positive features of this implementation, such as the ability to search, develop, and use technology in a positive way; being able to approach the problems positively; the ability to be patient; finding an answer in his own effort; desire and excitement to investigate… He used to ask us for help, but now he himself searches and finds. Last but not least, his self-confidence increased.*

In addition to the above positive opinions, only one participant (Metin's parent) expressed a negative opinion. He stated that there was no change in student behaviours; that it did not contribute to his motivation; that the model did not work, and that he considered the activities given by the researchers as "work load".

> ***Metin:*** *Considering the behaviours of my son, the model seems useless. He just had to do some of his assignments via internet and computer, which didn't seem to be very productive, but I don't have any data on learning outcomes. Technical problems made the job more difficult. He started to use the computer more and he had to spend more time on homework.*

### Views of Students

During the research process, two semi-structured interviews were conducted with the students. The first interview incudes 18 students while the second one was actualized with 22 students. The researcher analysed data using content analysis. Data from both interviews were combined to be presented under various codes and categories here (Figure 3).

The students stressed that they were generally positive about the FCM-based implementation process, that it led to learning by having fun and improved their language skills, that it was better than the traditional teacher-student instruction, that it increased students' attitudes towards school and lesson, and that it fostered academic development and learning. In terms of doing activities and homework, according to students, the time spent with technology became very useful, doing homework became easier, they did not get bored while doing homework, and the model increased their willingness to do homework.

According to the views of the students, the FCM-based activities provided various outcomes in terms of cognitive, affective, and psychomotor skills. In addition, the students generally liked activities based on group work (theatre, presentation, visual preparation, play).

Students preferred group works for various reasons such as job sharing, sharing ideas, creating more ideas, faster and more products, longer and qualified writing effective decision-making, increased happiness and respect and cooperation, easy solving problems, and the nice and fun side of working together. In addition, the students stated that they had difficulty in some activities such as writing text, making shapes with dummy and play dough, role preparation and role-play, and group work.

> ***Arda:*** *I have become successful in my lessons and my grades have increased. My ability in reading comprehension, writing and grammar have improved. I used to have difficulty in writing text. Now I can write… Not only do we learn how to use technology but also we learn Turkish by having fun.*
>
> ***Ayca:*** *I was always watching Youtube. These activities are more fun than watching the ridiculous things. I was getting excited and I was wondering what your activity would be when I went home… Homework is not workload anymore.*
>
> ***Batuhan:*** *My listening, speaking and understanding have improved, and it has also contributed to my math ability. I couldn't make problems before, but now I'm doing well. I didn't use to love Turkish lesson much, but now I love it… We feel happy, we respect each other and we get everyone's opinions.*
>
> ***Beren:*** *My handicraft and technology use skills have developed.*
>
> ***Ecrin:*** *I had difficulty in making puppets.*
>
> ***Erhan:*** *Sometimes I couldn't think due to noise. The group work worked well. Because sharing and correcting ideas is more appropriate for me rather than working by myself. I'm getting more successful.*
>
> ***Nihal:*** *I had so much fun and would love to do it all the time. It has been developing intelligence. My imagination and thoughts are improving.*
>
> ***Tarik:*** *Sometimes I had difficulty in writing theatre text and acting.*
>
> ***Yesim:*** *My computer use has improved. I could only play games before. Now I'm more comfortable with computers, I can do more. The activities are full of fun and better than the traditional lessons.*

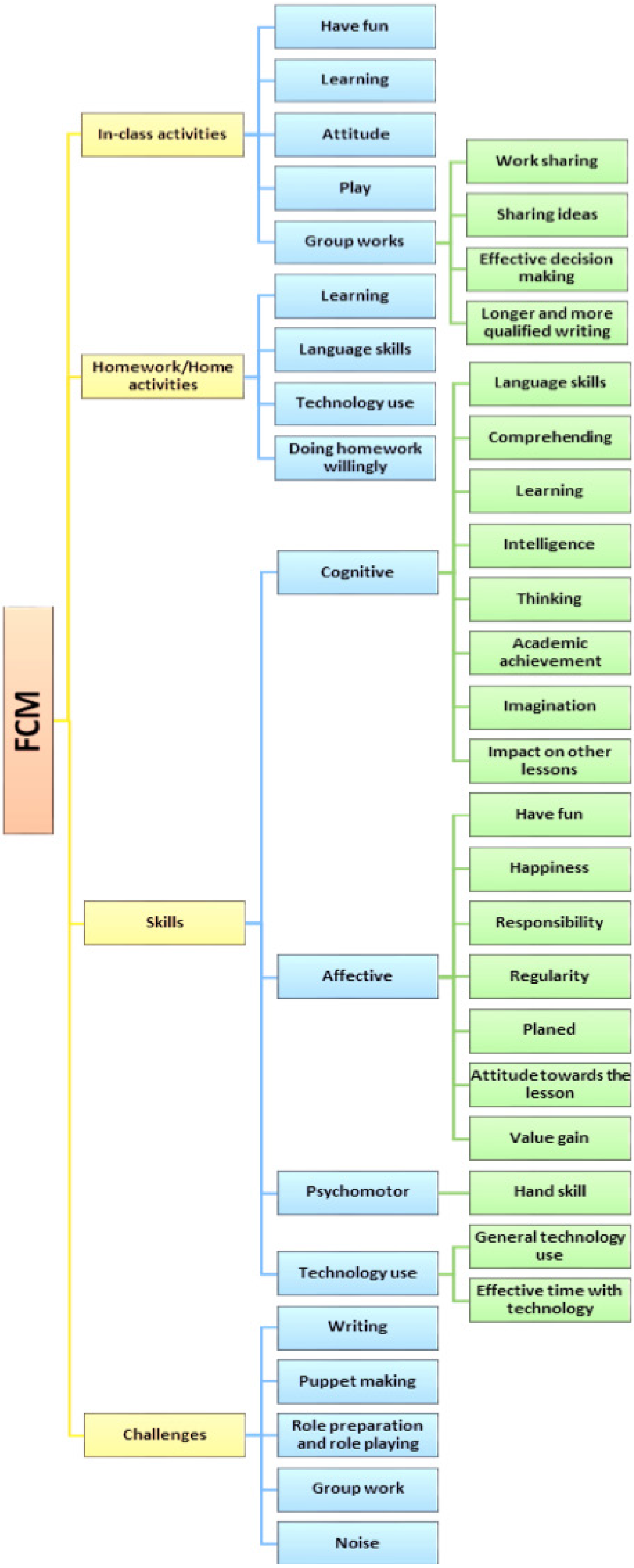


**Figure 3.** Codes and categories obtained from the views of students

### Views of the Teacher

At the end of the study, a semi-structured interview was conducted with the classroom teacher who was an observer in the classroom. The researcher analysed data using content analysis. Data were combined to be presented under various codes and categories here (Figure 4).

The teacher talked on the use of technology in the implementation process. He thinks that he and his parents are convinced that technology can be used in education. The teacher also has positive views about the FCM. He stated that the model could be used in many courses, that e-contents were successful, and that students came class preparedly owing to the use of in-class and out-of-class processes in a complementary manner, that they were willing to do activities as they loved the process and the researcher, and that they have adopted the model.

The teacher indicated that the texts, e-contents, activities presented during the application process were suitable for the student level. In addition, he stated that some outcomes (academic achievement, language skills, learning subjects, self-confidence) were achieved and some learning problems were overcome. Finally, the teacher stated that such models and applications could be used by disseminating technology-based educational projects and appropriate e-learning content at primary level.

> *"At the beginning, we had some shortcomings in terms of technology. After getting to know the process, both parents and we have witnessed how computers have been used in education. We all have to let children use the computer for educational purposes. The applicability of the model is quite high, so it is successful. I think it can contribute to the change in education in basic courses. Activities were nice. When the students watched them at home, they came to school preparedly and did not get tired ... They loved the applications and you (the reseacher) as well. Therefore, they have adopted the method... Activities and texts were suitable for students. They understood some topics well. Thanks to group works and presentations, their speaking in front of public skill was developed. Even children who did not attend classes developed self-confidence. We observed good outcomes."*

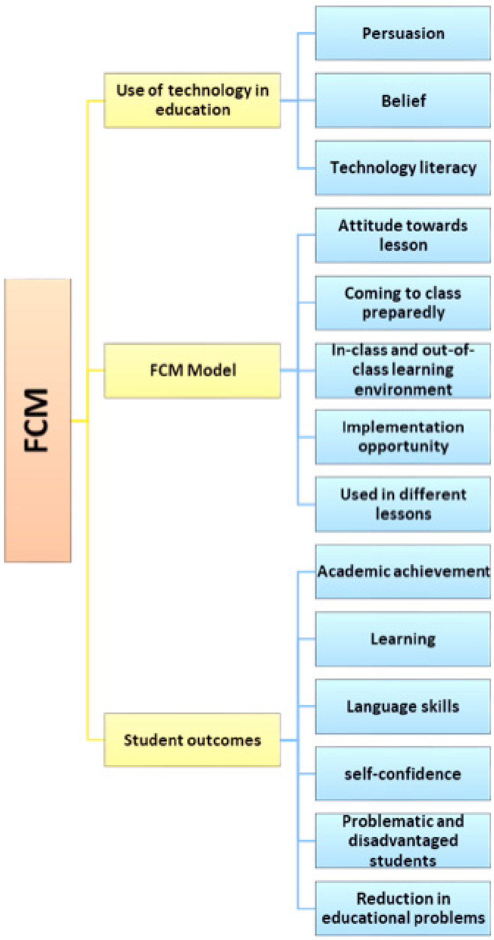


**Figure 4.** Codes and categories obtained from the views of the teacher

## Findings Related to the Process of the Flipped Classroom Model

In this study, the focus was on the whole components of the process as much as possible, rather than focusing only on some aspects of the teaching-learning process. Thus, it has been tried to create an effective teaching-learning environment, culture and process. In the context of the second research question, the process was examined in depth. With the help of multiple data collection methods and tools, various situations that affect the development of basic language skills in classroom and out-of-class processes have been reached. In this framework, since the natural environment of the process was observed, there was no case of controlling different variables. Within this framework, various codes and categories related to FCM implementation process have been reached (Figure 5).

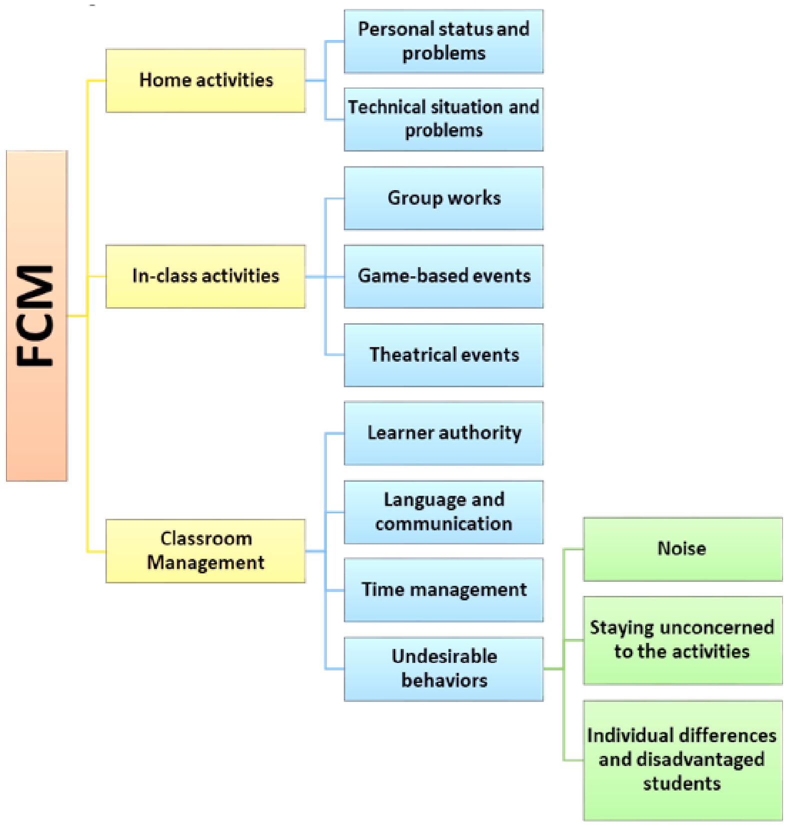


**Figure 5.** Findings related to the process of the Flipped Classroom Model

### Home Activities

Home activities refer to the completion of e-learning content and activities within the times and/or environments apart from the school and/or course hours with the help of technological components. These processes include technical and technological infrastructure (hardware, software, website or platform), e-learning contents (text, video, audio, visual), collection of responses, and participant follow-up.

In general, the level of student participation in home activities was noted to be low at the beginning, but it started to increase later. Thus, considering home activities, the number of participants joining activities A, B, C and D was between 14 and 18 while the whole class (23 students) participated in Activity E. The mean of all activities was 20 students.

Some disadvantaged students had participation problems. Especially, Ozan who had the ADHD report participated in almost half of the home activities. Although the teacher contacted his family several times (e.g. Activity H), his participation was not at the desired level. In the process, some students could not participate in their home activities due to technical and technological problems. Accordingly, technological problems (such as internet outage, devices and their versions, lack of necessary applications and programs) negatively affected the students' participation in home activities.

### In-class Activities

Thanks to the home activities, there were activities in which the students could learn, reinforce and repeat the subjects during the classroom period. At the same time, a great attention was paid to different enriching activities such as individual or group works, games, theatre, drama, preparing visuals, and visual and auditory presentations.

They were mind-empowering, thought-provoking, cooperative, educational, instructive, exciting, enjoyable and fun activities that generally made students active, increased their participation, interest, attention and motivation (e.g. Activity H, J, K, L). In such activities, students did not go out of class even during breaks (e.g. Activity H). As an example, students were watched a promotional video of a "National Park" in Turkey as home activity and asked them to answer some questions about the video. In class activities, students' questions were answered, and the text was discussed. Then they were given various materials and asked to create their own national parks. Here, the students were asked to prepare a text to introduce their national parks and to do research on the plants and animals living in their national park. The students worked in groups of two. In this process, the students discussed with their group friends about what kind of national park they should create, shared their tasks and made research. At last, they made their parks together on cardboard with various cutting and gluing works. Eventually they gave a presentation to other students introducing their national parks (Appendix 1). In addition, the students in the audience position of the presentations were given an evaluation form and they were asked to evaluate the presenter group. At the end of the activity, the students stated that not only their language skills but also their thinking, research and hand skills, group work, imagination and creativity improved.

In addition to the language skills, improvement was observed in various outcomes, such as social, technology use, imagination, discussion, estimation and appreciation. For example, as the activity progresses, it was noted that; the capability to use language skills was developed (Activity K); the quality and quantity of texts were improved in writing skills (Activity J, K). In terms of speaking skills, the fear of speaking in public decreased while responsibility and motivation increased (Activity L, M); qualifications, subject matter and remarkable contents were handled considering visual presentation (self-expression with visual), imagination, creativity (Activity H, K). Also, there were developments in theatrical skills (Activity M); and also learning increased and misuses reduced in grammar. In addition, considering working culture and group work, it was seen that the students worked in harmony, that the quality and quantity characteristics of the products improved, that skills such as not disturbing others improved, and that problematic behaviours decreased in group writing, product creation or game-based activities (Activity E, H, K, N) (Appendix 1).

Classroom management influenced the implementation process in which intensive interactive activities were performed. Sometimes undesirable behaviours, noise, irrelevant behaviours of some students, time management, technical problems, and individual characteristics of students or being in a disadvantaged group made classroom management difficult. On the contrary, using positive communication language, thanking students, honouring and supporting them had a positive impact on classroom management. In this way, it was observed that the problems started to decrease after the second week (e.g. Activity D and E) and almost disappeared in the next activities (see Activity K). The problems of some disadvantageous student gradually decreased or disappeared. For example, there was an increase in the participation and product qualifications of Asli who had learning difficulties and focusing problems and who become distracted in lessons (e.g. Activity E and F). Nevin, -who was shy and had learning difficulties, who did not participate in activities, who almost never even spoke- played an active role, especially, in speech-based activities (presentation, digital story). Tarik, who used to be problematic, started to participate in the activities and an improvement was observed in terms of his behaviours, the quality of the products he prepared, his self-confidence, interest and attitude, academic achievement, and language skills (e.g. Activity E and M). Thus, it was observed that a learning culture was gradually formed in the classroom.

## CONCLUSION, DISCUSSION AND RECOMMENDATIONS

This study aims to examine the role of the FCM in the development of the basic language skills of 4th grade students in Turkish language lesson and the the views of participants related to the process. The results displayed positive and important outcomes in terms of the applicability of the model in the Turkish language lesson with 4th grade students of a school with middle socio-economic level.

Although the selected sample was a classroom where almost no technology was used previously, in the process and at the end of the study, student expressed positive views (Wang et al., 2019) which can be interpreted that the hesitations about the use of technology in education have been eliminated. Therefore, if the teacher -who is in direct contact with the students and parents- has the self-confidence and self-efficacy perception of technology integration, and if the teacher can use various methods, applications, techniques, technology, and developments effectively in the teaching-learning process, it can be claimed that the teacher can change the perspectives of other stakeholders and bring success (academic, belief, attitude) (Bayrak & Hirca, 2016; Oral, 2008).

Unlike the traditional teaching-learning process, students have achieved various outcomes as this model has remarkable, interesting, motivational, entertaining, instructive, and multidisciplinary activities that formed rich experiences for language skills; that were based on individual and group works; that requires movement, interaction and participation; that were based on learner authority, self paced, flexible, independent working and learning environment, individualizing the learning content (Baepler, Walker & Driessen, 2014; Bishop & Verleger, 2013; Moran & Young, 2015). It means that a practice-based learning environment was provided for the students to learn by doing (Bosner, Pickert & Stibane, 2015).

In the process, it has been observed that the students have the courage to express themselves effectively in various ways (writing, presentation, discussion, visual, banner, theatre, drama) and to carry out their works that are difficult to do with self-confidence. Some studies have parallel results (Ahmad, 2016; Ekmekci, 2017; Girmen & Kaya, 2019; Mo & Mao, 2017; Ozdemir & Acik, 2019; Turan & Akdag-Cimen, 2019; Awidi & Paynter, 2019). As students were given a plenty of time in activities, activities (such as producing ideas, designing the product, preparing and explaining when necessary) contributed to the development of students' skills and creativity while enabling them to work freely and produce products. Therefore, it can be said that the FCM formed a student-centred and effective learning environment . These results are in parallel with the studies in the related literature (EARGED, 2007; Gould, 2007; Kardas & Uca, 2016; Kardas & Ozturk, 2015; Gocer & Garip, 2020; Tunagur, Kardas & Kardas, 2021).

At the end of this study, it was seen that the FCM had important opportunities for Turkish language lesson. It can be said that significant developments can be seen in students' language and other related skills when the in-class and out-of-class activities are structured and maintained. During the implementation process, activities based on individual or group works, games and theatre activities were included. These activities enhanced the efficiency of the FCM by enriching the implementation process (Girmen & Kaya, 2019). In this regard, it is stated in the related literature that such activities contribute positively to the various skills by activating students and increasing their participation (Enfield, 2013; Gilboy, Heinerichs & Pazzaglia, 2015; Talan & Gulsecen, 2019); they contribute students' academic development (Cheng, Ritzhaupt & Antonenko, 2019; Karagol & Esen, 2019); their permanent and in-depth learning (Gogebakan-Yildiz, Kiyici & Altintas, 2016; Danker, 2015; Gasmi, 2016); development of language, communication and social skills (Samuel, 2019); development of various cognitive skills like metacognitive awareness, critical, creative, reflective high level thinking skills (Danker, 2015; Hwang, Yin, & Chu, 2019; Kong, 2014; Carpenter, 2016; Chen, Hwang & Chang, 2019), affective skills like taking responsibility and self-efficacy (Bond, 2019; Lai & Hwang, 2016), and psychomotor skills like some fine hand skills, using technological devices (Huang & Hong, 2016); working with peers; their decision-making skills; and respect each other's ideas (Sonnenwald & Li, 2003; Millis, 2010; Michaelsen, Davidson & Major, 2014; Akandere, 2013; Akoz & Toptas, 2009; Karakaya, 2007; Kavak & Koseoglu, 2007; Ulubey & Toraman, 2015; Akar Vural & Somers, 2011). In addition, such activities facilitate student-centeredness and differentiated teaching (Fulton, 2014) and develop authentic learning based on role-playing, real-life experiences and discovering (Murphy, 2009; Elbistanli, 2015).

Language lessons differ from other courses as they require texts to improve language skills. Instructional contents are used in the teaching of language rules. In this context, only reading and a small amount of listening texts are presented in the traditional teaching-learning process. However, since only reading or listening to texts takes a lot of time in the classroom, there is not enough time left to conduct activities for language skills (Kirmizi & Akkaya, 2009; Taskaya & Musta, 2008). Since reading / listening and preparing texts is done outside the classroom, in-class time is expanding and various activities can be made easily. According to this, effective time management can be ensured in FCM process (Bergmann & Sams, 2012).

The diversity of text types (fairy tales, stories, cartoons, poems), the sources (Turkish and world literature) and the way it was presented (reading text in digital media, listening text in mp3 format, comics, animation films, documentaries) strengthened the process of the FCM in this study. Thus, increasing the students' curiosity and interest level, individual differences were considered. These results are supported by literature (Sahin & Bayramoglu, 2016; Asici, 1997; Cecen & Ciftci, 2007; Cakir, 2013).

As frequently performing activities that require movement, interaction and participation during the implementation process reduces classroom management problems, effective time management actualised and the activities were conducted as planned. Thus, the in-class activities turned into processes that were learned by having fun; that provided learning and participation motivation by arousing curiosity and attention; that enhanced emotional bond with school, lessons and teachers (Alamri, 2019; Galvez, 2017; Awidi & Paynter, 2019; Chien & Hsieh, 2018; Danker, 2015; Gogebakan-Yildiz, Kiyici & Altintas, 2016; Aycicek & Yanpar Yelken, 2018). In this context, teachers can ensure the completion of the teaching-learning process with maximum benefit by planning extended, longer-lasting interdisciplinary activities with the mother language lessons. Therefore, the relationship between the mother language lessons and other lessons (Bloom, 1995; Taskaya & Musta, 2008; Albayrak & Erkal, 2003; Guneyli et al. 2010) shows that the study of language skills in other courses will not be a waste of time.

During the implementation of the FCM, parental participation is of paramount importance, especially in terms of observing out-of-class activities. Therefore, thanks to activities that bring the student and family together, the effective involvement of families in the process positively influenced the views of students and families, and provided the families with a one-to-one observation environment. The fact that parents had a chance to observe the process of the FCM closely is one of the reasons why the participants had positive views about the model and process. So, in the process of the FCM, family involvement can be ensured (Bond, 2019).

According to the results, the FCM shows parallelism with various learning theories, teaching-learning approaches and various findings (Fulton, 2014; Chang, 2016). As seen in results, the FCM has a very close relationship with learner-centred education and effective learning. In this context, learner-centered education approach is associated with many concepts such as flexible learning, self-directed learning and experiential learning. Therefore, multidimensionality comes to the fore in student-centered application processes. (O'Neill & McMahon, 2005).

In order to realize student centeredness, While the teacher facilitates the students to structure the information in the application processes, the student acts as the person who is active in the learning process, makes choices according to their own needs, and thus is responsible for their own learning (Lea, Stephenson & Troy, 2003; Burnard, 1999). In this way, student-centered education offers students the opportunity to effectively manage their own learning processes (Acat, 2005). The students who were freed in home activities, by taking their own learning responsibilities, realized their own learning within in-class activities and in individual and group activities. The role of the teacher in the process has been in the position of facilitating learning, guiding the student, helping them think and produce ideas. In this respect, student development was reflected in their behaviours and attitudes, products and opinions. Beside that it can be said that the process of the FCM helps student be what Maslow called "self-actualizing individual"; that it provides students with the opportunity to achieve high-level skills in the Bloom taxonomy; that it is intertwined with almost all concepts of constructivist paradigm: that it is related to Vygostky's "zone of proximal development"; that it coincides with Piaget's cognitive research and concepts; that it is parallel with the concepts and views of Dewey, Bruner and Ausubel on education (Ornstein & Hunkins, 2016). Therefore, it is seen that the FCM serves many thoughts, theories, models and approaches regarding "learning" by planning the implementation process well.

It can be seen that the implementation process served all of the basic components of the FCM (FLN, 2014). In other words, those students worked in a digital environment without time and space limit in the home activities and that they worked on various activities based on individual and group activities in classroom activities was related to the "Flexible Environments" component. The teaching-learning process, which was formed by the characteristics of the application process, was based on "Learning Culture" component. Diversifying the texts and activities used in the process was about "Intentional Content" component. Finally, the researcher's playing a role in the process (in terms of planning, implementation, teaching, classroom management, identifying and intervening problems, monitoring process and development) served the "Professional Educator" component. Therefore, it can be said that the study process has been completed in accordance with the FCM.

It should be kept in mind that there may be various limitations of the model. Each of the planning, preparation, implementation and evaluation stages passes intensively. The most important challenges faced in this research process were preparing the Internet environment; monitoring the participation and development of students; technical support and instant communication; data storage in digital media; selecting texts; designing, preparing, digitizing, editing and adapting e-learning content; providing diversity of activities and content; preparing student-centred and active learning-based activities; and producing solutions to problems by observing the process. Situations such as time, space, technological opportunities, low technology acquisition and usage levels of students, the familiarization period of the students at the beginning of the application process, embracing the systematic of the model, and participation and classroom management negatively affected the implementation process of the model. These situations are in parallel with the limitations encountered in the literature (Balci, 2017; Bergmann & Sams, 2012, 2016; Girmen & Kaya, 2019; Bergmann, Sams & Gudenrath, 2014; Durak Uguten & Balci, 2017; Filiz, Orhan-Goksun & Kurt, 2016; Saitta et al., 2016; Turan & Goktas, 2015; Yuan & Moran, 2018). However, it can be said that the learning culture in the classroom that was formed by ensuring the continuity of student-centred and active learning-based activities eliminated many negativities and limitations.

As a result, it can be said that the FCM-based teaching-learning process, conducted in accordance with the Turkish Curriculum, has been successful. It can be thought that this situation will lead to the success of the curriculum, make students to keep up with the requirements of the digital age, and help students acquire 21st century skills. Therefore, teaching-learning environments based on the FCM should be enriched with supportive contents and activities together with technology supported models, methods and techniques. At this point, all stakeholders, especially teachers, should take responsibility in the process

According to the results, some suggestions related to implementation for practitioners of the educational processes can be presented. In parallel with this study, in terms the implementation of the FCM in Turkish language lesson, it is suitable to do comprehension-based works (reading, listening, watching of the text) at home while it is appropriate to do in-depth studies on the text as well as studies related to speaking and writing skills in the classroom. In addition, the effectiveness of the model may increase if the teacher monitors the student participation in home activities and observe whether the text is comprehended before attending the classroom. Beside that individual/group works based on effective learning and student-centeredness as well as a variety of interdisciplinary activities need to be applied in order to help students use their all language skills as well as high-level thinking skills and gain as much language experience as possible. Effective participation of disadvantaged students should be supported in this process.

Along with the FCM, the Turkish language lesson can include versatile, multidimensional, long-term individual and group studies, games, theatrical activities, audiovisual studies and interdisciplinary studies.

In order to enhance students' all language skills, higher level thinking skills, and to gain as much language experience as possible, some studies based on student-centered can be planned such as individual and group works, active learning activities, high participation and interaction activities, individual differentiated and interdisciplinary studies. However, it may be useful to have alternative activity plans, such as worksheets or individual activity plans, to avoid problems related to participation in activities that may result from individual differences or the characteristics of students in the disadvantaged group. In addition, some problems regarding classroom management can be seen in this process. Situations such as approaching students positively and constructively, doing activities that require participation, increasing participation in activities, frequently playing games, and using technology actively can be helpful in preventing many problems. In this way, economics can be achieved in time management and time usage.

The texts to be used must be in different digital formats. Providing diversity in visual or auditory contents such as reading/listening texts, videos, visuals, cartoons, animations, short films, news avoids boredom of students and addresses their curiosity, interest, imagination and individual differences.

It is important for the teachers, who have the role of the FCM to plan the implementation process, prepare, implement and evaluate their content, to be professional trainers required by the model. In this respect, the process should start with the teacher training process. Starting from the undergraduate period, the pre-service teachers and the teachers who are working must be trained in the process about technology integration, technology supported teaching methods and their adaptation to the related course.

By supporting the active participation of students in the disadvantaged group in activities and lessons, academic and social development of these students can be achieved.

In out-of-school learning processes, some activities and contents that students can complete with their families could be designed. Thus, because of students' participation and satisfaction level, it will be ensured that the activities performed in the teaching-learning process are accepted by the families.

According to the results, some suggestions for researchers can be presented. In parallel with this study, further studies can be conducted (i) with students and schools at different socioeconomic levels, (ii) at different levels of education, (iii) in different lessons, and (iv) with different research designs.

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## REFERENCES

Acar, T. (2012). Turkiye'nin PISA 2009 sonuclarina gore OECD'ye **uye** ve aday **ulkeler** arasindaki yeri. *Kuram ve Uygulamada Egitim Bilimleri, 12*(4), 2561-2572.

Acat, M. B. (2005) *Ogrenci merkezli egitimde ogrenme ortami boyutlarinin duzenlenmesi*. V. Uluslararasi Egitim Teknolojileri Sempozyumu, Sakarya: Sakarya Universitesi.

Ahmad, S. Z. (2016). The flipped classroom model to develop Egyptian EFL students' listening comprehension. *English Language Teaching, 9*(9), 166–178.

Akandere, M. (2013). *Egitici okul oyunlari*. Ankara: Nobel.

Akar Vural, R. & Somers, J. W. (2011). *Humanist ilkogretim programlari icin ilkogretimde drama: Kuram ve uygulama*. Ankara: Pegem.

Akbaba-Altun, S. (2009). Ilkogretim ogrencilerinin akademik basarisizliklarina iliskin veli, ogretmen ve ogrenci goruslerinin incelenmesi. *Ilkogretim Online*, *8*(2), 567-586.

Akoz, Y. & Toptas, B. (2009). Ilkogretim *4. sinif* ogrencilerinin *Turkce dersinde* ogrendigi *kelimelerin anlamlarinin karsiliginin zihinsel olarak kavrama duzeylerinin incelenmesi*. VIII. Ulusal Sinif Ogretmenligi Egitimi Sempozyumu. Eskisehir: Eskisehir Osmangazi Universitesi Egitim Fakultesi.

Alamri, M. M. (2019). Students' academic achievement performance and satisfaction in a flipped classroom in Saudi Arabia. *International Journal of Technology Enhanced Learning*, *11*(1), 103–119.

Albayrak, M., & Erkal, M. (2003). *Basariya giden yolda ifade ve beceri derslerinin (Turkce-Matematik) birlikteligi. Milli Egitim Dergisi,* 158.

Asici, M. (1997). *Turkce* **ogretiminde** *metin ve metin incelenmesi*. Istanbul: Eyuboglu Egitim Kurumlari.

Awidi, I. T., & Paynter, M. (2019). The impact of a flipped classroom approach on student learning experience. *Computers & Education*, *128*, 269-283.

Aycicek, B., & Yanpar Yelken, T. (2018). The Effect of Flipped Classroom Model on students' classroom engagement in teaching English. *International Journal of Instruction*, *11*(2), 385-398. https://doi.org/10.12973/iji.2018.11226a.

Baepler, P., Walker, J. D., & Driessen, M. (2014). It is not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers & Education,* 78, 227–236.

Balci, O. (2017). An investigation of the relationship between language learning strategies and learning styles in Turkish freshman students. *English Language Teaching, 10*(4), 53-61. DOI: https://doi.org/10.5539/elt.v10n4p53.

Basal, A. (2012). *The use of flipped classroom in foreign language teaching*. The 3rd Black Sea ELT Conference "Technology: A Bridge to Language Learning", November 15-17, 2012, Samsun.

Basal, A. (2015). The implementation of a Flipped Classroom in foreign language teaching. *Turkish Online Journal of Distance Education*, *16*(4), 28-37.

Bayat, N., Sekercioglu, G. & Bakir, S. (2014). Okudugunu anlama ve fen basarisi arasindaki iliskinin belirlenmesi. *Egitim ve Bilim*, *39*(176).

Bayrak, N., & Hirca, N. (2016). FATIH Projesi hizmetici egitimine katilan ogretmenlerin tekno-pedagojik ozyeterliklerinin incelenmesi. *Gazi Universitesi Gazi Egitim Fakultesi Dergisi*, *36*(1). 95-111.

Bergmann, J. & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. Washington, DC: International Society for Technology in Education.

Bergmann, J. & Sams, A. (2014). *Flipped learning: Gateway to student engagement*. International Society for Technology in Education.

Bergmann, J. & Sams, A. (2016). *Flipped learning for elementary intruction*. International Society for Technology in Education.

Bergmann, J., Sams, A. & Gudenrath, A. (2014). *Flipped learning for English intruction*. International Society for Technology in Education.

Bilgin, N. (2006). *Sosyal bilimlerde icerik analizi: Teknikler ve ornek calismalar*. Ankara: Siyasal.

Bishop, J. L., & Verleger, M. A. (2013). *The flipped classroom: A survey of the research.* In ASEE National Conference Proceedings, Atlanta, GA.

Blair, E., Maharaj, C., & Primus, S. (2016). Performance and perception in the flipped classroom. *Education and Information Technologies*, *21*(6), 1465-1482.

Bloom, B. S. (1995). Insan *nitelikleri ve okulda* ogrenme (Cev. D. A. Ozcelik). Ankara: Milli Egitim.

Bond, M. (2019), Flipped learning and parent engagement in secondary schools: A South Australian case study. *British Journal of Educational Technology*, *50*(3), 1294-1319. https://doi.org/10.1111/bjet.12765.

Bosner, S., Pickert, J., & Stibane, T. (2015). Teaching differential diagnosis in primary care using an inverted classroom approach: Student satisfaction and gain in skills and knowledge. *BMC medical education, 15*(1), 1.

Bozkurt, B. U. (2016). Turkiye'de okuma egitiminin karnesi: PISA olceginden cikarimlar. *Abant Izzet Baysal Universitesi Egitim Fakultesi Dergisi, 16*(4), 1673-1686.

Brown, H. D. (2007). *Teaching by principles: An interactive approach to language pedagogy*. New York: Longman.

Burnard, P. (1999). Carl Rogers and postmodernism: Challenged in nursing and health sciences. *Nursing and Health Sciences, 1*, 241–247.

Cakir, P. (2013). Turkce ders kitaplarindaki oykulerin cocuga gorelik ilkesi acisindan incelenmesi. *Turkish Studies, 8*(1), 1171-1180.

Carbaugh, E. M., & Doubet, K. J. (2015). *The differentiated flipped classroom: A practical guide to digital learning*. Thousand Oaks, CA: Corwin.

Carpenter, R. (2016). Flipping the creativity class: Creating active-learning environments for student innovations. In *Best Practices for Flipping the College Classroom* (J. B. Waldrop & M. A. Bowdon, Eds.) (pp. 118-130). Routledge.

Cecen, M. A. & Ciftci, O. (2007). Ilkogretim 6. sinif Turkce ders kitaplarinda yer alan metinlerin tur ve tema acisindan incelenmesi. *Millî Egitim, 173*, 39-42.

Ceran, D. & Deniz, K. (2015). TEOG sinavi sorularinin okuma becerisiyle cozulebilme duzeyi. *Ana Dili Egitimi Dergisi, 3*(2), 92-109.

Chang, S. H. (2016). *The marriage of Constructivism and Flipped Learning*. Indiana University Southeast. http://files.eric.ed.gov/fulltext/ED565608.pdf.

Chen, M. A., Hwang, G., & Chang, Y. (2019), A reflective thinking-promoting approach to enhancing graduate students' flipped learning engagement, participation behaviors, reflective thinking and project learning outcomes. *British Journal Educational Technology, 50*, 2288-2307. https://doi.org/10.1111/bjet.12823.

Cheng, L., Ritzhaupt, A. D., & Antonenko, P. (2019). Effects of the flipped classroom instructional strategy on students' learning outcomes: A meta-analysis. *Educational Technology Research and Development*, *67*(4), 793-824. https://doi.org/10.1007/s11423-018-9633-7.

Chien, C. F., & Hsieh, L. H. C. (2018). Exploring university students' achievement, motivation, and receptivity of Flipped Learning in an Engineering Mathematics Course. *International Journal of Online Pedagogy and Course Design (IJOPCD)*, *8*(4), 22-37. https://doi.org/10.4018/IJOPCD.2018100102.

Cockrum, T. (2017). Emerging models of practice in Flipped English language arts classrooms. In *Applying the Flipped Classroom Model to English Language Arts Education* (C. A. Young & C. M. Moran, Eds.) (pp. 160-176). IGI Global.

Danker, B. (2015). Using Flipped Classroom approach to explore deep learning in large classrooms. *IAFOR Journal of Education*, *3*(1), 171-186.

Demircan, C. & Inandi, Y. (2008). Koy Enstituleri programlarinda anadilinin onemi ve Turkce ogretimi. *Mersin Universitesi Egitim Fakultesi Dergisi, 4*(1), 1-13.

Demirel, O. & Sahinel, M. (2006). Turkce ve sinif ogretmenleri icin Turkce ogretimi. Ankara: Pegem A.

Durak Uguten, S. & Balci, O. (2017). Flipped learning. *Journal of Suleyman Demirel University Institute of Social Sciences, 1*(26), 253-265.

EARGED (2007). Ogrenci *merkezli egitim uygulama modeli*. Ankara: MEB.

Ekmekci, E. (2017). The Flipped writing classroom in Turkish EFL context: A comparative study on a new model. *Turkish Online Journal of Distance Education*, *18*(2), 151-167.

Elbistanli A. (2015). Otantik ogrenme (Ed. A. Ari). *Alternatif* ogrenme ogretme *yaklasim ve yontemleri* icinde 85-98. Konya: Egitim.

Elo, S. & Kyngas, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing, 62*(1), 107-115. https://doi.org/10.1111/j.1365-2648.2007.04569.x.

Enfield, J. (2013). Looking at the impact of the flipped classroom model of instruction on undergraduate multimedia students at CSUN. *Techtrends: Linking Research & Practice To Improve Learning*, *57*(6), 14-27.

Filiz, O., Orhan-Goksun, D. ve Kurt, A. A. (2016). Yuksekogretimde Donusturulmus Siniflar: Ozel Ogretim Yontemleri dersi ornegi. *Egitim Teknolojileri Okumalari* (Ed. A. *Isman*, H. F. Odabasi ve B. Akkoyunlu) icinde, 615-632.

Flipped Learning Network (2014). https://flippedlearning.org/definition-of-flipped-learning/

Fulton, K.P. (2014). *Time for learning: Top 10 reasons why flipping the classroom can change education*.Corwin.

Galvez, H. (2017). Flipped instruction for language learning. In *Flipped Instruction: Breakthroughs in Research and Practice* (pp. 131-144). IGI Global.

Gasmi, A. A. (2016). An exploratory study of students' lived experiences in a blended-flipped writing class. *Arab World English Journal, 3*, 210–226.

Gerber, B. L., Cavallo, A. M. L. & Marek, E. A. (2001). Relationships among informal learning environments, teaching procedures and scientific reasoning ability. *International Journal of Science Education, 23*(5), 535- 549.

Gilboy, M. B., Heinerichs, S. & Pazzaglia, G. (2015). Enhancing student engagement using the flipped classroom. *Journal of Nutrition Education and Behavior*, *47*(1), 109-114. https://doi.org/10.1016/j.jneb.2014.08.008.

Girmen, P., Kaya, M. F. & Bayrak, E. (2010). *Turkce egitimi alaninda yasanan sorunlarin lisansustu tezlere dayali olarak belirlenmesi*. 9. Ulusal Sinif Ogretmenligi Egitimi Sempozyumu, 20-22 Mayis 2010, Elazig, s. 133-138.

Gocer, A , Garip, S . (2020). Turkce Dersi Sosyal Etkilesime Dayali Sinif Ortamlarinin Ogrencilerin Anlatma Becerilerinin Gelistirilmesindeki Yeri. *Adnan Menderes* Universitesi *Sosyal Bilimler Enstitusu Dergisi , 7* (2) , 16-32 . Retrieved from https://dergipark.org.tr/en/pub/adusobed/issue/58668/730199.

Gogebakan-Yildiz, D., Kiyici, G., & Altintas, G. (2016). Ters-yuz edilmis sinif modelinin ogretmen adaylarinin erisileri ve gorusleri acisindan incelenmesi. *Sakarya University Journal of Education*, *6*(3), 186-200. http://dx.doi.org/10.19126/suje.281368.

Gould, J. S. (2007). Dil becerilerinin ogrenimi ve ogretimine olusturmaci bir perspektif. (S. Durmus, *Cev.* Ed.) *Yapilandirmacilikta Teori Perspektifler ve Uygulama* icinde s. *111-123.* Ankara: Nobel.

Gunes, F. (2009). Turkce ogretiminde gunumuz gelismeleri ve Yapilandirici Yaklasim. *Mustafa Kemal Universitesi Sosyal Bilimler Enstitusu Dergisi*, *6*(11), 1-21.

Gunes, F. (2012). Testlerden etkinliklere Turkce ogretimi. *Dil ve Edebiyat Egitimi Dergisi*, *1*(1), 31-42.

Guneyli, A. (2007). *Etkin ogrenme yaklasiminin anadili egitiminde okuma ve yazma becerilerini gelistirmeye etkisi*, (Yayinlanmamis Doktora Tezi), Ankara Universitesi, Ankara.

Guneyli, A., Ozder, H., Konedrali, G., & Arsan, N. (2010). Ilkogretim ogrencilerinin Turkce ile diger ders basarilari arasindaki iliski. *Akdeniz Egitim Arastirmalari Dergisi Mediterranean Journal of Educational Research, 123*, 60.

Huang, Y.N., & Hong, Z.R. (2016). The effects of a flipped English classroom intervention on students' information and communication technology and English reading comprehension. *Educational Technology Research and Development, 64*(2), 175–193.

Hung, H. T. (2015) Flipping the classroom for English language learners to foster active learning, *Computer Assisted Language Learning, 28*(1), 81-96.

Hwang, G. J., Yin, C., & Chu, H. C. (2019). The era of flipped learning: promoting active learning and higher order thinking with innovative flipped learning strategies and supporting systems. *Interactive Learning Environments, 27*(8), 991-994. https://doi.org/10.1080/10494820.2019.1667150.

Johansen, D. & Cherry-Paul, S. (2016). *Flip your writing workshop: A blended learning approach*. Portsmouth, NH, Heinemann Educ., Books.

Karaduz, A. (2016). Elestirel paradigma ve dil ogretimi (A. Karaduz, Ed.). *Elestirel dil becerileri: Kuram ve uygulama* icinde s. 1-34. Ankara: Pegem.

Karagol, I., & Esen, E. (2019). The effect of flipped learning approach on academic achievement: A meta-analysis study. *Hacettepe University Journal of Education, 34*(3), 708-727. https://doi.org/10.16986/HUJE.2018046755.

Karakaya, N. (2007). Ilkogretimde drama ve ornek bir uygulama. *Gazi* Universitesi *Gazi Egitim Fakultesi Dergisi, 27*(1), 103-139.

Kardas, M. N. & Uca, N. (2016). Aktif ogrenme yontemi-nin kullanildigi calismalarin ogrenci basarisi, tutumu ve gorusleri acisindan incelenmesi: Bir Meta-analiz Calismasi. *Uluslararasi Turk Egitim Bilimleri Dergisi (UTEB), 4*(7), 119-130 .

Kardas, M. N. & Ozturk, Y. (2015). Aktif ogrenme tekniklerinin Turkce ogretiminde basari, tutum ve uygulamalara yonelik ogrenci gorusleriyle iliskisi: Bir meta-analiz calismasi. *International Journal of Languages' Educa-tion and Teaching UDES* Ozel *Sayisi,* 1682-1692.

Katirci, E. (2010). *Farkli* coklu *ortamlarin* ogrencilerin *mekanik konusundaki kavram yanilgilarinin giderilmesine ve bilissel yuklenmelerine etkilerinin incelenmesi: Gorsel uzamsal zekâ boyutunda bir analiz*. (Unpublished Master's Thesis). Marmara University, Istanbul.

Kavak, N., & Koseoglu, F. (2007). Yapilandirici ogrenme yaklasimina dayali rol oynama ogretim yonteminin avantaj ve dezavantajlari. *Gazi* Universitesi *Gazi Egitim Fakultesi Dergisi, 27*(2), 309-325.

Kilic, E. (2006). Coklu ortamlara dayali ogretimde paralel tasarim ve gorev zorlugunun universite ogrencilerinin basarilarina ve bilissel yuklenmelerine etkisi. (Unpublished Doctoral Dissertation). Ankara University, Ankara.

Kirk, J. & Miller, M. L. (1986). *Reliability and validity in qualitative research*. Ca: Sage.

Kirmizi, F. S. & Akkaya, N. (2009). Turkce ogretimi programinda yasanan sorunlara iliskin ogretmen gorusleri. *Pamukkale Universitesi Egitim Fakultesi Dergisi, 25*, 42-54.

Kong, S. C. (2014). Developing information literacy and critical thinking skills through domain knowledge learning in digital classrooms: An experience of practicing flipped classroom strategy. *Computers & Education*, *78*, 160-173. http://dx.doi.org/10.1016/j.compedu.2014.05.009.

Lage, M. J., Platt, G. J. & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *The Journal of Economic Education*, *31*(1), 30-43.

Lai, C. L., & Hwang, G. J. (2016). A self-regulated flipped classroom approach to improving students' learning performance in a mathematics course. *Computers & Education*, *100*, 126-140. https://doi.org/10.1016/j.compedu.2016.05.006.

Lea, S. J., Stephenson, D. & Troy, J. (2003). Higher education students' attitudes to student centered learning: Beyond 'educational bulimia'. *Studies in Higher Education, 28*(3), 321–334.

Michaelsen, L. K., Davidson, N. & Major, C. H. (2014). Team-based learning practices and principles in comparison with cooperative learning and problem-based learning. *Journal on Excellence in College Teaching, 25*(3&4), 57-84.

Millis, B. J. (2010). Promoting deep learning. *IDEA paper*, *47*.

Mills, G. E. (2003). *Action research: A guide for the teacher researcher*. New Jersey: Prentice-Hall.

Mo, J., & Mao, C. (2017). An empirical study on the effectiveness of college English reading classroom teaching in the flipped classroom paradigm. *Revista de la Facultad de Ingenieria, 32*(10), 632–639.

Moran, C. M. (2014). *Changing paradigms: A mixed methods study of flipping the English language arts classroom*. (Unpublished Doctoral Dissertation), North Carolina State University.

Moran, C. M. (2018). “Just Don’t Bore Us To Death”: Seventh graders’ perceptions of flipping a technology-mediated English language arts unit. *Middle Grades Review*, *4*(1), 1-17.

Moran, C., & Young, C. A. (2015). Active learning in the flipped English language arts classroom. In *Curriculum Design and Classroom Management: Concepts, Methodologies, Tools, and Applications* (pp. 588-609). IGI Global.

Murphy, S. H. (2009). Real authentic learning. *Principal Leadership, 9*(6), 6-8.

O’Neill, G. & McMahon, T. (2005) Student–centered learning: What does it mean for students and lecturers?. O’Neill, G., Moore, S., McMullin, B. (Eds.) In *Emerging Issues in the Practice of University Learning and Teaching*. Dublin: AISHE.

O’Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *The internet and higher education*, *25*, 85-95.

Ongoz, S., Aydin, S. & Aksoy, D. A. (2016). Turkiye’de Egitim Bilimleri alaninda yapilan coklu ortam konulu lisansustu tezlerin egilimleri. *Journal of Instructional Technologies & Teacher Education*, *5*(1), 45-58.

Oral, B. (2008). The evaluation of the student teachers’ attitudes toward Internet and democracy, *Computers & Education, 50*, 437–445.

Ornstein, C. A., & Hunkins, P. F. (2016). Curriculum: foundations, principles and issues. USA: Pearson.

Ozdemir, O. & Acik, F . (2019). Development of written expression skills with Flipped Learning instruction: An embedded mixed method study. *Hacettepe University Journal of Education, 34*(4) , 1075-1091. https://doi.org/10.16986/HUJE.2019048710.

Ozdemir, O. (2017). Turkce ogretiminde dijital teknolojilerin kullanimi ve bir web uygulamasi ornegi. *Electronic Turkish Studies*, *12*(4), 427-444.

Pasisis, G. (2015). *The flipped reading block: Making it work*. New York: Scholastic.

Peregoy, S., & Boyle, O. (2012). *Reading, writing and learning in ESL: A resource book for teachers*. New York: Allyn & Bacon.

Rogers, P. L. (2001). *Designing instruction for technology enhanced learning*. London: IRM.

Rossi, R. D. (2014). *Improving student engagement in organic chemistry using the inverted classroom model*. Paper presented at 2014 Spring ConfChem: Flipped Classroom Online. Retrieved March 10, 2021 from the World Wide Web: http://confchem.ccce.divched.org/2014SpringConfChemP7.

Sahin, D. & Bayramoglu, C. D. (2016). 2015 Turkce ogretim programinin metin tur ve tema secimi bakimindan degerlendirilmesi. *Turkish Studies, (Prof. Dr. Hayati Akyol Armagani), 11*(3), 2095-2130. http://dx.doi.org/10.7827/TurkishStudies.9289.

Saitta, E., Morrison, B., Waldrop, J. B., & Bowdon, M. A. (2016). Introduction: Joining the flipped classroom conversation. In *Best Practices for Flipping the College Classroom* (pp. 1-16). Routledge.

Samuel, M. L. (2019). Flipped pedagogy and student evaluations of teaching. *Active Learning in Higher Education*, 24, 10. https://doi.org/10.1177%2F1469787419855188.

Sever, S. (2011). *Turkce* ogretimi *ve tam* ogrenme. Ankara: Ani.

Sonnenwald, D. H. & Li, B. (2003). Scientific collaboratories in higher education: exploring learning style preferences and perceptions of technology. *British Journal of Educational Technology*, *34*(4), 419-431.

Talan, T., & Gulsecen, S. (2019). The effect of a Flipped Classroom on students’ achievements, academic engagement and satisfaction levels. *Turkish Online Journal of Distance Education*, *20*(4), 31-60.

Taskaya, S. M. & Musta, M. C. (2008). Sinif ogretmenlerinin Turkce ogretim yontemlerine iliskin gorusleri. *Elektronik Sosyal Bilimler Dergisi, 7*(25), 240-251.

Temizyurek, F. & Unlu, N. A. (2015). Dil ogretiminde teknolojinin materyal olarak kullanimina bir ornek: “Flipped classroom”. *Bartin* Universitesi *Egitim Fakultesi Dergisi, 4*(1), 64-72.

Tosun, N. (2017). Implementation of web 2.0-supported flipped learning in the learning management systems course: An experience from Turkey. The Malaysian Online Journal of Educational Management (MOJEM), 12. https://doi.org/10.22452/mojem.vol6no1.1.

Tunagur, M., Kardas, N., & Kardas, M. (2021). The effect of student centered listening/speaking activities on turkish listening speaking skills of bilingual students. *International Journal of Education and Literacy Studies, 9*(1), 136-149. Doi: http://dx.doi.org/10.7575/aiac.ijels.v.9n.1p.136.

Turan, Z. & Goktas, Y. (2015). Yuksekogretimde yeni bir yaklasim: Ogrencilerin ters yuz sinif yontemine iliskin gorusleri. *Yuksekogretim ve Bilim Dergisi, 5*(2), 156-164.

Turan, Z., & Akdag-Cimen, B. (2019). Flipped classroom in English language teaching: A systematic review. *Computer Assisted Language Learning*, 1-17. https://doi.org/10.1080/09588221.2019.1584117.

Ulas, A. H. (2002). *Klâsik donem soz ve anlam biliminin Turkce ve edebiyat* ***ogretiminde*** *fonksiyonel kullanimi.* (Yayimlanmamis doktora tezi), Ataturk *Universitesi*, Erzurum.

Ulubey, O. & Toraman, C. (2015). Yaratici drama yonteminin akademik basariya etkisi: Bir meta-analiz calismasi. *Mustafa Kemal* Universitesi *Sosyal Bilimler Enstitusu Dergisi, 12*(32), 195-220.

Ural, A. & Ulper, H. (2013). Ilkogretim matematik ogretmeni adaylarinin matematiksel modelleme ile okudugunu anlama becerileri arasindaki iliskinin degerlendirilmesi. *Kuramsal Egitimbilim Dergisi, 6*(2), 214-241.

Varisoglu, B., Sahin, A. & Goktas, Y. (2013). Turkce egitimi arastirmalarinda egilimler. *Kuram ve Uygulamada Egitim Bilimleri*, *13*(3), 1767-1781.

Wang, Y., Huang, X., Schunn, C. D., Zou, Y., & Ai, W. (2019). Redesigning flipped classrooms: a learning model and its effects on student perceptions. *Higher Education*, *78*(4), 711–728. https://doi.org/10.1007/s10734-019-00366-8.

Yagmur Sahin, E., Kana, F. & Varisoglu, B. (2013). Turkce egitimi bolumlerinde yapilan lisansustu tezlerin arastirma egilimleri. *International Journal of Human Sciences*, *10*(2), 356-378.

Yildirim, A. & Simsek, H. (2008). *Sosyal bilimlerde nitel arastirma yontemleri*. Ankara: Seckin.

Yuan, C. & Moran, C. M. (2018). Flipped Classroom in China: Design, practice, and implications. In *Digital Transformation and Innovation in Chinese Education* (pp. 119-135). IGI Global. https://doi.org/10.4018/978-1-5225-2924-8.ch007.

Zulfikar, H. (2011). Turkcenin anlatim gucu uzerine degerlendirmeler. *Turk Dili, 713*, 387-399.

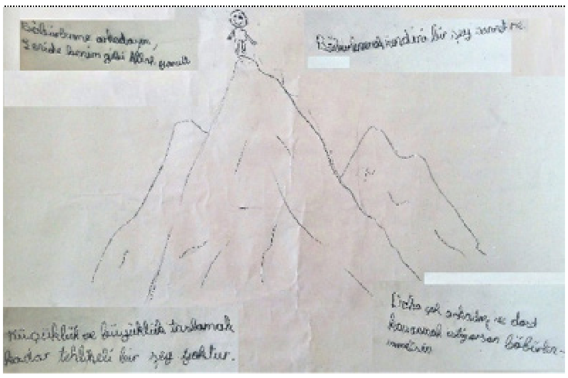
## APPENDIX

**Picture 1.** Examples of Student's Activities

Activity K: Visual preparation and visual expression

(When the cloud arrived, he saw a child. He was a guy with glasses and curly hair. He had a bubble tube and made bubbles. While some bubbles were as small as ants, some of them were as big as the sun. the cloud was very worried when he saw these bubbles because he thought he'd be sentenced in a balloon. That was the kid's purpose. The boy made a balloon as big as the cloud. The cloud just wanted to escape. He's barely curling through the bubbles. The child was very upset and cried. As the child cried, the bubbles grew twice more. The cloud saw this situation and took the child and put him in the bubble. They flied around the sky and had fun together.)

Activity L: Visual creation and written expression (creation and presentation of national park project)



Activity F: Poster works (Do not boast dear friend. We are all created by Allah. There is nothing dangerous as much as riding a high horse. Do not boast, if you want to win more friends.)


Activity A (slogan and visual creation): *"Do good things and good things will happen to you"*

Activity G: Writing (Creating stories by sorting images)


Activity F: Poster work (Do not boast, Do not commit suicide)

Activity F: Creating a digital story with play doughs

Activity C: Group activity (writing and visual presentation)

Activity J: Cup game (composing a song)

Activity C: Role-playing activity

Activity D: Puppet Theatre

# BARRIERS TO ONLINE LEARNING: ADJUSTING TO THE 'NEW NORMAL' IN THE TIME OF COVID-19

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## ABSTRACT

School closures during the COVID-19 pandemic have transferred learning online, in the first experience of online learning for most students in Saudi Arabia. This study specifically examines the barriers facing Secondary school students, providing suggestions for overcoming these barriers, as gathered from educational technology specialists. A mixed methodology was adopted, with interviews first being carried out with four parents and four students to discover details of the barriers that they face. This helped develop an online survey involving 518 respondents to identify the most frequently cited barriers. Curriculum barriers had the most impact in terms of hindering the learning process, followed by teaching, the learning environment, and social barriers. These four barriers were significantly greater in public-sector schools, compared to private schools. There were also statistically significant differences between male and female students. Moreover, students with access to digital devices and the Internet experienced more teaching barriers, learning environment barriers, and social barriers than those who did not. The survey results were presented to educational technology experts to suggest solutions to the problems of technology adoption. The above experts agreed on the need for a virtual learning environment (VLE) that would help develop students' self-learning, research, and critical thinking skills.

**Keywords:** COVID-19, online learning, barriers, curriculum, virtual learning environment.

## INTRODUCTION

COVID-19 refers to the novel coronavirus, first reported in humans in 2019 in the city of Wuhan, China. It is a member of a family of viruses with disease strains in birds and mammals (Perveen et al., 2020), but which can cause respiratory illnesses in humans, starting with common cold symptoms and sometimes developing into serious lung disease (Perveen et al., 2020). Moreover, these viruses can cause high stress and severe symptoms of anxiety and depression (Joseph et al., 2020).

The United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2020) has reported that 1,184,126,508 learners have been affected by COVID-19, which is equal to 67.6% of all learners enrolled across 143 countries. One country that has been particularly affected in its education sector is Saudi Arabia, the focus of this current study. The first confirmed case of COVID-19 in Saudi Arabia was reported on 2nd March 2020. Early precautionary measures were implemented when the number of cases rose to 15, in order to protect citizens. The country's borders were closed and any citizens who had been outside the country within the preceding two weeks were obliged to quarantine for 14 days and undergo a medical examination (Alshammari et al., 2020). The Saudi Ministry of Health recommended various precautions for citizens such as maintaining a social distance of at least two meters, sheltering in place at home, wearing masks, and observing curfews, until these measures became part of people's lives.

On 9th March 2020, the Saudi Ministry of Education announced the closure of schools in Saudi Arabia, due to the COVID-19 pandemic. This suspension of school attendance was replaced by online learning, taking place through the 'Unified Education System': a virtual learning environment (VLE) that was expressly designed to enable distance listening for students (Hodges et al., 2020). On 16th April 2020, the Ministry of Education announced that all school students would be promoted to the higher tier, based on their first semester grades, and that distance learning would continue until 7th May in Elementary schools, and until 14th May in Intermediate and Secondary schools. Between these dates, learning would take place online. However, the experience of online learning during this period has not been evaluated to identify its weaknesses, so that it can be developed for future use. Moreover, the present researcher has noted many complaints from parents and students, concerning the numerous barriers that they faced while attempting to learn online. These complaints concerned matters relating to the VLE, and the lack of communication with schools and teachers. Therefore, this research aims to evaluate the learning process, identify the barriers facing students in their online learning during the COVID-19 pandemic, particularly from the start of this pandemic till the end of the second semester 2020, and suggest technical solutions based on the opinions of specialists in teaching technology.

## LITERATURE REVIEW

### Defining Distance/Online Learning

'Distance learning' is the oldest term used to describe learning that is provided to students who are geographically remote (Moore et al., 2011). In distance learning, the learning content is delivered via various media: originally books, and later, CDs or TV channels. With the emergence of technology, other terms came into use, such as 'online learning' and 'e-learning'. Assareh and Bidokht (2011) define e-learning as instruction that is delivered by computers, the Internet, satellite, or other remote technologies. It can be synchronous, with the learner and teacher attending class at the same time, or asynchronous, where learners can access and study content at their convenience. Moreover, this delivery can take place either partially or fully online (Gedik et al., 2013). Meanwhile, online learning is an updated version of distance learning, with improved access to material, and activities enabled by technology (Benson, 2002). Thus, researchers consider 'distance education' as an umbrella term that includes online and e-learning, where various media are used to deliver instruction (Conrad, 2006; Dede, 1996). Online learning and e-learning can therefore be used interchangeably (Clark, 2002). In this study, online learning refers to learning that has taken place via a VLE and at a distance, while students are at home in quarantine.

Overall, the online learning implemented during the COVID-19 pandemic has been fundamentally different from the online learning that took place previously, as asserted by Al Lily et al. (2020), citing the following reasons: (1) Suddenness, as schools were not prepared for its use; (2) Internationalization, since it is a universal solution for suspending school attendance; (3) Popularity, as it has been common across societies; (4) Expansion, because it extends from kindergarten to Secondary school education, whereas it was previously only used in universities, and (5) Imposition and medical emergency, out of necessity to limit the spread of the novel coronavirus. In addition, learning during this crisis is not considered as distance learning within its common definition, because content development, multiple media, learning management, and professional development were not fully prepared to deliver the online learning (Hodges et al., 2020). Hence, it could be called 'emergency remote teaching', as suggested by Hodges et al. (2020).

### Barriers to Online Learning

More recently, studies have been carried out to examine the impact of COVID-19 on learning. Abbasi et al. (2020) examined college students' perceptions of e-learning throughout the COVID-19 pandemic in a cross-sectional study, using a survey. The above authors found that 77% of the sampled students had negative perceptions of e-learning and preferred face-to-face teaching. However, this result may be justified by the learners finding the quality of the e-learning content poor and lacking in teacher/student interaction. It highlights the importance of applying the necessary measures to improve e-learning.

Al Lily et al. (2020) report some ramifications of implementing online learning during the pandemic, especially the failure of certain students to take their learning seriously, whereby they appeared to treat quarantine as a vacation. These students considered learning purely as a process that takes place in face-to-face encounters, which was exacerbated by the absence of the self-learning concept in Arab culture and education. Therefore, parents have become involved in their children's learning process. However, some families with more than one child studying at the same time were found to be distracted by having to supervise coinciding learning sessions. Moreover, permitting children to use electronic devices for learning gave those children an opportunity to waste time accessing social media apps. Another important issue facing some families has been their inability to provide a device for each child, or their lack of a rapid Internet connection for downloading and watching live sessions. With regard to the teachers, they have proved to have a weak relationship with parents. Moreover, there was a lack of training for teachers, who were forced into this regime without any preparation or in-service training, as they had never delivered online learning before. This was confirmed by Schoepp (2005) and Mulenga and Marbán (2020), who found that from the teachers' perspective, the main barriers were the limited knowledge and skills of faculty staff to integrate technology effectively.

Although many researchers do not consider the learning that has taken place during the COVID-19 pandemic to be regular online learning, as mentioned previously, it is expected that the learners will have faced similar barriers to those encountered by the online learners investigated in the previous literature. Researchers have classified these barriers in different ways. For example, Assareh and Bidokht (2011) highlight four types of barrier, which they outline in detail: (1) The learners themselves, including their access to computers and the Internet, and their confidence in using them, as well as their motivation, financial problems, assessment tools, sense of isolation, and poor skills and experience in distance learning; (2) The teachers, including the adequacy of their knowledge of the e-learning environment and their difficulties with assessment; (3) The curriculum, including vagueness, and a lack of quality and resources, and (4) The school, involving structural factors and support services.

Conversely, in investigating the barriers to e-learning, Mungania (2003) classifies them into seven main categories, based on the barriers that are most frequently cited by learners: (1) Situational barriers, relating to students' lives, the most prominent being their lack of time to study, family or work commitments, and interruptions; (2) Content suitability barriers, such as poor quality content and assessment, irrelevant course material, and the unsuitability of content for the learners; (3) Technological barriers, for example, VLE quality, VLE navigation issues, and technical support and connection problems; (4) Instructional barriers, such as unclear instructions, limited multimedia, too few resources, limited feedback, information overload, and a lack of student/teacher interaction; (5) Learning style; (6) Organizational barriers, like accredited certification after completion, online course availability, and registration issues, and (7) Personal barriers, such as time management and attitudes to e-learning.

## Principles of Online Learning Design

Despite the difficulties faced by students in online learning during the COVID-19 pandemic, Mulenga and Marbán (2020) found that it could still be a positive solution to help learners proceed in their education. Moreover, numerous researchers have recommended specific principles to be considered when designing online courses for distance learning. For example, Song et al. (2004) advocate organizing online courses by providing learning goals, specifying expectations from learners, giving directions for using the VLE, establishing schedules with deadlines to help students manage their time, and providing examples of the end product. Moreover, the above authors emphasize the importance of assisting learners with technical and academic matters. Meanwhile, learning content should be delivered in various formats to meet the learners' different learning styles. In particular, it is recommended to divide the content into smaller chunks, and to present learners with different types of learning resource and activity to facilitate their understanding of that content, as well as engaging and encouraging them to actively construct their learning. Consequently, their motivation may be increased (Ras et al., 2005).

Other principles should likewise be considered, such as recording rather than live-streaming lessons, so that learners can pause and replay as required. Thus, learning can be monitored through the VLE, learners can be given access to a digital library, and content can be delivered via different media (Hawker, 2004). In particular, students' self-efficacy is an important factor of success in e-learning, as it depends on students' ability to learn independently and cope with their new role in the learning environment (Vrazalic et al., 2009). This role consists of engaging with the teacher, participating in activities, and interacting with the new pedagogy (Vrazalic et al., 2009). In addition, students should be provided with authentic materials and challenging activities to attract and hold their attention (Vrazalic et al., 2009). Furthermore, the teaching metrics in distance learning need to be changed, so that teachers can establish and maintain contact with their students via a VLE or by email, while keeping in touch with students' parents using mobile phones and apps like WhatsApp and Twitter (Burke & Dempsey, 2020).

### Gender and the Barriers to Online Learning

Many studies have examined the differences between male and female students regarding the barriers to online learning. Muilenburg and Berge (2005) found gender to be a significant variable that affected students' evaluation of online learning barriers. Meanwhile, Vrazalic et al. (2009) noted that female students were less excited by e-learning than their male peers. Similarly, Aljaraideh and Al Bataineh (2019) observed that female students faced more barriers than male students, in terms of e-learning use. However, Jung (2012) identified that more family and academic support was provided to female students, compared to male students, who usually suffered due to financial problems.

As presented in the literature reviewed here, extensive studies have been conducted on the impact of the COVID-19 pandemic on Saudi society, as viewed from different perspectives, such as health, psychology, and society itself. However, very few studies have examined the impact of COVID-19 to identify the barriers facing Saudi students, for whom this was their first online-learning experience (most Saudi students). Thus, the current study aimed to identify the barriers faced by students when attempting to learn online. Specifically, this study considers factors such as school type, gender, and ownership of a personal computer, which have not been covered in the literature to date. Therefore, to fill this knowledge gap, the following research questions were formulated to guide the investigation:

1. What barriers to online learning have students considered significant during the COVID-19 pandemic?
2. Are there any significant differences in students' views of these barriers to online learning, according to the type of school attended (public or private)?
3. Are there any significant differences in students' views of the barriers to online learning, based on their gender?
4. Are there any significant differences in students' views of the barriers to online learning, based on their current access to digital devices and the Internet?
5. Are there any significant differences in students' views of the barriers to online learning, based on ownership of a personal computer?
6. Are there any significant differences in students' views of the barriers to online learning, based on their experience of online learning?
7. What suggestions do teaching-technology specialists make to overcome the barriers identified by students?

## METHODOLOGY

### Research Design and Participants

This research was carried out using a mixed methods approach, whereby a qualitative method was initially adopted, with four parents (working mothers of more than one child in Intermediate and Secondary schools) and four students (two female and two male students from public-sector Secondary schools) being interviewed to identify the obstacles that they faced while learning online during the COVID-19 epidemic. The researcher carried out these interviews to help identify the main themes for the next stage of data collection. The limited number of interviewees during this stage was due to the aim of identifying some general themes relating to the barriers that Saudi students face in their online learning. Moreover, it was difficult to sample respondents for interview during the restricted and stressful conditions of the pandemic.

Based on the interview results and according to the literature review, a survey was designed to identify the barriers to online learning from the perspective of a large sample of students. This stage took place in two steps: a pilot study, in which an online survey was conducted with 100 students, and the main study, with the same survey conducted with 518 students. The participants comprised both genders, selected using a purposeful sampling procedure. The inclusion criteria in this study consisted of having studied online during the COVID-19 epidemic, specifically as a student at a Secondary school supervised by the East Education Department in Dammam, Saudi Arabia. In this region, there are 77 Secondary schools. The survey was sent out to teachers working under Dammam's East Education Department, so that they could administer it to their students, and directly to any students known to the researcher in the region. In total, 518 responses were expected. This limited number was the result of the circumstances arising from the pandemic. In addition, the sample was chosen because it was considered that Secondary school students would be mature enough to make a thoughtful and reasoned judgement of their learning situation, unlike their younger counterparts.

After analyzing the survey results and ranking the obstacles, the researcher carried out interviews with four technology specialists, all faculty members of Educational Technology Departments at different universities in Saudi Arabia, in order to gather their detailed suggestions for overcoming the obstacles to online learning. These experts were holders of Master's or PhD degrees in educational technology, and were teaching online using a VLE during the COVID-19 pandemic.

## Instruments

The first interviews to be carried out with parents and students included the open question, 'What have been the barriers faced by students while learning online during the COVID-19 pandemic?'. Several probing questions were asked during the interviews to gather more details about the type of school attended; the roles of the teacher, administration, and family; the availability of computers and the Internet, and the provision of support. The purpose of this study was explained to the participants before they started answering any questions, whether in the survey or in the interviews. It was also explained to them that they could withdraw from the survey or interviews at any time.

The second stage consisted of an online survey to collect data. This survey was designed according to an analysis of the interview results and literature review (Almanthari et al., 2020; Muilenburg & Berge, 2005). It contained two sections: demographic questions to better understand the participants' school type and technical circumstances, and 35 statements using a 5-point Likert scale to examine the impact of different variables. The validity of the scale was verified in different ways, such as through content validity. This was conducted by sending the scale constructs and statements in their preliminary form to five specialists in educational technology, curricula, and teaching methods, in order to evaluate the correctness of the 39 statements and their appropriateness to the constructs. The percentage of agreement between the experts' views ranged between 80% and 100%. All items except four scored 80%. Consequently, four statements were deleted, and one was moved to another construct. Meanwhile, the wording of five of the statements was changed.

Secondly, the scale's construct validity was examined by performing factor analysis. The purpose of this was to reduce a large number of variables into smaller factors, using an oblique rotation process. A pilot study was performed on a sample of 100 students from the study population, who were not included in the original research sample. Common factorial criteria were used to extract the factors, and the minimum factor loading was set to 0.35 in the final model. The factors also needed to yield Eigenvalues greater than 2.0, and to explain a substantial percentage of total variance. The result of the factor analysis was 0.581 in the Kaiser Meyer Olkin (KMO) test, which is higher than 0.5. Therefore, it was verified that the use of factor analysis was suitable for this study. The Chi-square value (X2) was 2742.80, indicating overall significance of the correlation matrix ($p=0.001$).

The first version of the scale contained 35 items. Factor analysis was carried out and four items (2, 15, 21, 31) were deleted, as they did not belong to the constructs. Factor analysis was performed again, and one item (30) (less than 0.35) was deleted. The final version of the scale contained 30 items, distributed across four constructs (see Table 1, below).

**Table 1.** *Structure matrix on the scales factor after rotation*

| Structure Matrix | | | | |
|---|---|---|---|---|
| Items | Component | | | |
| | 1 | 2 | 3 | 4 |
| 1 | .498 | | | |
| 2 | .574 | | | |
| 3 | .711 | | | |
| 4 | .645 | | | |
| 5 | .527 | | | |
| 6 | .751 | | | |
| 7 | | .406 | | |
| 8 | | .500 | | |
| 9 | | .387 | | |
| 10 | | .389 | | |
| 11 | | .676 | | |
| 12 | | .415 | | |
| 13 | | .490 | | |
| 14 | | .797 | | |
| 15 | | .681 | | |
| 16 | | .506 | | |
| 17 | | .873 | | |
| 18 | | .836 | | |
| 19 | | .551 | | |
| 20 | | | .442 | |
| 21 | | | .540 | |
| 22 | | | .651 | |
| 23 | | | .783 | |
| 24 | | | .643 | |
| 25 | | | .795 | |
| 26 | | | .769 | |
| 27 | | | | .705 |
| 28 | | | | .848 |
| 29 | | | | .825 |
| 30 | | | . | .649 |
| Variance | 32.972 | 10.119 | 8.524 | 7.718 |

This result showed that the data: did not produce an identity matrix, were multivariate normal, and were fit for exploratory factor analysis. The four factors were designated as: ‘Teacher barriers’, ‘Learning environment barriers’, ‘Curriculum barriers’, and ‘Social barriers’.

To determine the validity of the scale’s internal consistency, the researcher calculated the correlation coefficients between the scores for each statement, and the total score of the dimension to which each statement belonged, as presented in Table 2, below.

**Table 2.** *Internal consistency of the scale*

| Teacher Barriers | | Learning Environment Barriers | | | | Curriculum Barriers | | Social Barriers | |
|---|---|---|---|---|---|---|---|---|---|
| Item | R | Item | R | Item | R | Item | R | Item | R |
| 1 | .720** | 7 | .733** | 14 | .781** | 20 | .463** | 27 | .765** |
| 2 | .613** | 8 | .761** | 15 | .787** | 21 | .622** | 28 | .854** |
| 3 | .819** | 9 | .674** | 16 | .482** | 22 | .651** | 29 | .776** |
| 4 | .789** | 10 | .706** | 17 | .494** | 23 | .831** | 30 | .759** |
| 5 | .673** | 11 | .609** | 18 | .757** | 24 | .626** | | |
| 6 | .685** | 12 | .624** | 19 | .773** | 25 | .734** | | |
| | | 13 | .733** | | .634** | 26 | .721** | | |

Correlation between each item and the total score for its sub-scale (n=100)

** 0.01 level

Table 2 illustrates that the correlation co-efficient is significant at the level 0.01, indicating the scale's internal consistency.

Cronbach's alpha and split half were then used to compute the scale's reliability. Split half reliability was computed after the scale was divided into two equivalent parts. The reliability values are reported in Table 3, below.

**Table 3.** *Reliability of the scale (n=100)*

| Sub-scales | Cronbach's Alpha | Split Half |
|---|---|---|
| Teacher Barriers | .810 | .836 |
| Learning Environment Barriers | .899 | .957 |
| Curriculum Barriers | .796 | .827 |
| Social Barriers | .791 | .846 |
| Total | .920 | .942 |

Table 3 shows that the alpha values ranged between 0.791 and 0.899, while the alpha value of the scale's total score was .920, and the split half ranged between 0.827 and 0.957. Meanwhile, the split half for the scale's total score was .942, indicating its reliability. Reliable coefficient values of between 0.7 and 0.9 are acceptable (Lewis-Beck et al., 2003).

After an analysis of the survey and interview results, conducted before the third stage, educational technology specialists were interviewed online to gather their suggestions for overcoming the barriers to online learning. For these interviews, the Zoom application was used, presenting the experts with the barriers to online learning, via the shared screen. The ethics procedure implemented in the previous stages was also applied here. In particular, the experts were asked the question: 'What do you suggest to overcome these barriers to technology use?'. During the interviews, numerous probes were used to discover the nature of the suggested apps or websites, their purpose, and whether they were free of charge or for payment.

## Data Analysis

The qualitative data were analyzed using coding and thematic analysis. Themes were inducted from these data, in a search for common themes in the details provided by parents and students. The author coded the interviews, while an independent researcher performed coding separately. Inter-rater reliability was then assessed in a discussion of the coding by the author and the independent researcher, until they reached an agreement. The interviews and data analysis were conducted in Arabic and the themes were translated so that they could be reported in this study.

The quantitative data were subsequently analyzed using descriptive statistics to answer the first research question, which was aimed at identifying students' perspectives of the significant barriers to online learning during the COVID-19 pandemic. An independent sample T-test was applied to answer Questions 2-6, in order to examine the barriers to online learning, based on differences between school type, gender, access to digital devices and the Internet, and the experience of online learning.

## FINDINGS

### Interviews with Parents and Students

To answer the first research question, interviews were carried out with the parents and students. All the parents agreed that they were under more pressure than usual because they had to follow up with their children, making sure that they had accessed the VLE and were engaged in their learning. What made this especially difficult was that no student or school attendance records were maintained, meaning that the teachers did not know who was attending classes. Moreover, parents were unable to communicate with schools to obtain passwords or answers to their inquiries. Three of the parents noted that their children were not serious about studying, but were rather lazy, and there was no means of obligating them to attend classes or study. Finally, two parents declared that they were unable to provide each of their children with a computer.

Meanwhile, the students' interviews revealed three general themes. Firstly, there were issues relating to the teachers, such as a teacher's method of explanation being incompatible with the students' learning style. Moreover, the students mentioned that the teachers sometimes dedicated too much time to explaining unimportant things in great detail. Secondly, there were barriers indicated in relation to the learning environment (the VLE), such as disorganized e-content. Students with low ability were unable to understand lessons because there was no communication between them and their teacher, and they could not ask their teacher to explain things further if the learning content was unclear. Furthermore, courses involving practical skills were difficult to undertake online. Thirdly, technical problems such as an unresponsive website or weak Internet connection were cited, as well as poor quality audio-recordings. Conversely, the students' learning was generally supported by their families in response to the restrictions imposed during the pandemic, whereby the students were provided with a computer and an Internet connection, so that they could access explanations for difficult lessons.

Based on these results, a number of statements were formulated as part of the survey, in order to investigate whether the students faced any significant barriers while learning online. For example, a teacher's method of explanation might not suit the learning style of every student. In addition, the teachers could not verify who was following the online instruction, or take note of any inquiries. Neither was the e-curriculum organized, and some students did not know where to start, owned no devices (i.e., laptops, tablets) to engage in e-learning, and could not communicate with their teacher.

## The Online Survey Results

### Participants' Demographics

As seen in Table 4 (below), the participants were male and female and from both private and public-sector schools. Other information was recorded, such as being able to access the Internet or digital devices, ownership of a computer, and experience of online learning.

**Table 4.** *Participants' demographics*

| Measure | Items | Number of Participants | Percentage |
|---|---|---|---|
| Type of school (public/private) | Public | 328 | 63.35% |
| | Private | 190 | 36.65% |
| Gender | Females | 322 | 62.2% |
| | Males | 196 | 37.8% |
| Accessing digital devices and the Internet | Yes | 484 | 93.5% |
| | No | 34 | 6.5% |
| Students' experience of online learning | Yes | 106 | 14.7% |
| | No | 412 | 85.3% |
| Ownership of a personal computer | Yes | 384 | 74% |
| | No | 134 | 26% |

## Barriers Facing Students in Online Learning, Based on the Survey

Before answering the study questions, a normality test was conducted on the study variables by calculating the mean, median, standard deviation, kurtosis and skewness values (see Table 5).

**Table 5.** *The mean, median, standard deviation, kurtosis and skewness of the study variables*

| Sub-scales | Teacher Barriers | Learning Environment Barriers | Curriculum Barriers | Social Barriers | Total |
|---|---|---|---|---|---|
| N | 518 | 518 | 518 | 518 | 518 |
| Mean | 20.44 | 42.37 | 25.27 | 8.59 | 96.67 |
| Median | 20.00 | 43.00 | 26.00 | 8.00 | 95.00 |
| Std. Deviation | 5.12 | 10.40 | 5.24 | 4.00 | 19.48 |
| Skewness | -0.06 | -0.10 | -0.46 | 0.96 | -0.05 |
| Kurtosis | -0.52 | -0.16 | -0.21 | 0.44 | 0.01 |

Table 5 shows the convergence of mean and median values, while the skewness and kurtosis values are reduced by between -3 and +3, indicating the normal distribution of data.

Meanwhile, the descriptive statistics for the scale statements (see Table 6) show that the mean values for the statements ranged from 1.90 to 3.94, while the standard deviation ranged from 1.12 to 1.39. These statements were divided into four constructs: the teacher barrier (items 1-6), the learning environment barrier (items 7-19), the curriculum barrier (20-26), and the social barrier (items 27-30).

**Table 6.** *Descriptive statistics for the scale statements*

| Items | Mean | Std. Deviation |
|---|---|---|
| The teacher does not have sufficient knowledge or skill to use e-learning during the Covid-19 pandemic. | 3.94 | 1.120 |
| The teacher's method of explanation might not suit all of the students' learning styles. | 3.39 | 1.129 |
| The teacher was able to practice class management skills. | 3.49 | 1.148 |
| I was able to communicate with the teacher through 'the unified learning system'. | 3.17 | 1.347 |
| There was no direct communication between the teacher and students. | 3.33 | 1.169 |
| During the online learning, the teacher was keen to encourage me to interact. | 3.11 | 1.231 |
| The school provided the necessary instructions to ensure the success of the online learning. | 3.14 | 1.298 |

| | | |
|---|---|---|
| The school followed up the students' attendance during the online learning. | 3.24 | 1.312 |
| The grading policy was not announced. | 3.12 | 1.172 |
| No extra classes were offered to scaffold weak students. | 3.81 | 1.175 |
| The unified learning system was not easy to use. | 3.56 | 1.325 |
| The interface of the unified learning system was attractive. | 3.16 | 1.144 |
| Navigating the unified learning system was easy. | 3.08 | 1.185 |
| I am interested in using online learning. | 3.56 | 1.399 |
| I have an Internet connection. | 3.24 | 1.389 |
| I was unable to access the e-learning system and it was unresponsive because of overloaded access. | 3.86 | 1.232 |
| The audio-quality of the online lesson was clear. | 3.02 | 1.177 |
| The video-quality of the online lesson was clear. | 2.90 | 1.200 |
| The e-resources available in the online learning system were in accordance with the curriculum. | 2.68 | 1.164 |
| The assignments were not in line with online learning. | 3.51 | 1.229 |
| It is not possible to learn the content of all subjects using online learning. | 3.42 | 1.159 |
| I was able to ask for support when I needed it. | 3.83 | 1.250 |
| The content for some subjects was difficult to learn online. | 3.86 | 1.162 |
| It was difficult to complete such a large number of assignments online. | 3.36 | 1.237 |
| It was difficult to learn because the teachers on the course were changing. | 3.74 | 1.163 |
| I did not receive feedback from the teacher. | 3.55 | 1.167 |
| My family provided me with a suitable atmosphere to study. | 2.20 | 1.295 |
| My family encouraged me to attend the virtual classes. | 1.90 | 1.122 |
| My parents were keener than me to have me attend the online classes and submit my assignments. | 2.00 | 1.233 |
| My family explained things that were not clear on my courses. | 2.48 | 1.332 |

To answer the first research question in full, with a view to identifying the barriers to online learning, viewed by the students as significant during the COVID-19 pandemic, the standard deviations and weighted average statistics for the constructs were calculated, as presented in Table 7, below.

**Table 7.** *Mean, standard deviations, and weighted average statistics for the scale constructs*

| Variable | N | M | SD | Weighted Average | Evaluative level |
|---|---|---|---|---|---|
| Teacher Barriers | 518 | 20.44 | 5.12 | 3.41 | Medium |
| Learning Environment Barriers | 518 | 42.37 | 10.40 | 3.26 | Medium |
| Curriculum Barriers | 518 | 25.27 | 5.24 | 3.61 | Medium |
| Social Barriers | 518 | 8.59 | 4.00 | 2.15 | Low |
| Total Barriers | 518 | 96.67 | 19.48 | 3.22 | Medium |

As presented in Table 7, the highest result reported was for 'Curriculum barriers', with a weighted average of 3.61 and a medium evaluative level. Next was 'Teacher barriers', with a weighted average of 3.41 and a medium evaluative level, followed by 'Learning environment barriers' with a weighted average of 3.26 and a medium evaluative level, and finally, 'Social barriers', with a weighted average of 2.15 and a low evaluative level.

To answer the second research question, which examined whether there were any significant differences in students' views of the barriers to online learning, based on school type (public or private), a T-test was conducted, as displayed in Table 8, below.

**Table 8.** *T-test results for differences according to school type (public or private)*

| Variable | Public | | | Private | | | t | Sig. |
|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | | |
| Teacher Barriers | 328 | 21.73 | 5.10 | 190 | 18.20 | 4.31 | 8.024 | 0.000 |
| Learning Environment Barriers | 328 | 44.85 | 10.14 | 190 | 38.11 | 9.45 | 7.476 | 0.000 |
| Curriculum Barriers | 328 | 26.13 | 5.18 | 190 | 23.80 | 5.03 | 4.982 | 0.000 |
| Social Barriers | 328 | 8.91 | 4.20 | 190 | 8.02 | 3.57 | 2.462 | 0.014 |
| Total | 328 | 101.62 | 18.96 | 190 | 88.13 | 17.31 | 8.056 | 0.000 |

Table 8 shows that there were statistically significant differences relating to school type (public or private) in terms of the teacher, learning environment, curriculum, social, and total barriers, in favor of public-sector schools.

To answer the third question, which aimed to examine whether there were significant differences in students' views of the barriers to online learning based on students' gender, a T-test was conducted; the results of which are presented in Table 9, below.

**Table 9.** *T-test results for the differences between male and female students*

| Variable | Females | | | Males | | | T | Sig. |
|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | | |
| Teacher Barriers | 322 | 20.96 | 5.05 | 196 | 19.57 | 5.12 | 3.026 | 0.003 |
| Learning Environment Barriers | 322 | 43.50 | 10.10 | 196 | 40.52 | 10.65 | 3.192 | 0.001 |
| Curriculum Barriers | 322 | 25.94 | 4.94 | 196 | 24.18 | 5.55 | 3.740 | 0.000 |
| Social Barriers | 322 | 8.83 | 4.19 | 196 | 8.19 | 3.65 | 1.748 | 0.081 |
| Total | 322 | 99.23 | 19.49 | 196 | 92.47 | 18.77 | 3.883 | 0.000 |

Table 9 shows that there were statistically significant differences between male and female students in terms of the teacher, learning environment, curriculum, and total barriers, in favor of the female students. However, there were no statistically significant differences between the male and female students regarding social barriers.

Next, the fourth research question aimed to identify whether there were any significant differences in students' views of the barriers to online learning, based on their access to digital devices and the Internet, answered using a T-test (see Table 10, below).

**Table 10.** *T-test results for the differences in students' access to digital devices and the Internet*

| Variable | Yes | | | No | | | t | Sig. |
|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | | |
| Teacher Barriers | 484 | 20.25 | 5.02 | 34 | 23.12 | 5.75 | -3.190 | 0.002 |
| Learning Environment Barriers | 484 | 41.85 | 10.20 | 34 | 49.82 | 10.60 | -4.395 | 0.000 |
| Curriculum Barriers | 484 | 25.24 | 5.19 | 34 | 25.82 | 5.97 | -0.632 | 0.528 |
| Social Barriers | 484 | 8.36 | 3.80 | 34 | 11.88 | 5.28 | -5.088 | 0.000 |
| Total | 484 | 95.69 | 18.99 | 34 | 110.65 | 21.23 | -4.405 | 0.000 |

Table 10 shows that there were statistically significant differences relating to the students' access to digital devices and the Internet, in terms of the teacher, learning environment, social, and total barriers, in favor of students with access to digital devices and the Internet. Nevertheless, there were no statistically significant differences in students' access to digital devices or the Internet in terms of curriculum barriers.

To answer the fifth question, which examined the significant differences in students' views of the barriers to online learning based on their ownership of a personal computer, a T-test was applied; the results of which are illustrated in Table 11, below.

**Table 11.** *T-test results for differences based on whether the students owned a personal computer*

| Variable | Yes | | | No | | | T | Sig. |
|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | | |
| Teacher Barriers | 384 | 19.98 | 5.08 | 134 | 21.73 | 5.01 | -3.439 | 0.001 |
| Learning Environment Barriers | 384 | 40.29 | 10.10 | 134 | 48.36 | 8.84 | -8.215 | 0.000 |
| Curriculum Barriers | 384 | 24.84 | 5.09 | 134 | 26.51 | 5.48 | -3.191 | 0.002 |
| Social Barriers | 384 | 8.01 | 3.38 | 134 | 10.24 | 5.05 | -5.720 | 0.000 |
| Total | 384 | 93.13 | 18.52 | 134 | 106.84 | 18.62 | -7.369 | 0.000 |

Table 11 shows that there were statistically significant differences based on whether the students owned a personal computer, specifically in terms of the teacher, learning environment, curriculum, social, and total barriers, in favor of students who did not possess a personal computer.

Finally, the sixth research question, 'Are there any significant differences in students' views of the barriers to online learning, based on their experience of online learning?' was also answered using a T-test, as presented in Table 12, below.

**Table 12.** *T-test results of the differences based on students' experience of online learning*

| Variable | Yes | | | No | | | T | Sig. |
|---|---|---|---|---|---|---|---|---|
| | N | M | SD | N | M | SD | | |
| Teacher Barriers | 106 | 19.64 | 5.52 | 412 | 20.64 | 4.99 | -1.798 | 0.073 |
| Learning Environment Barriers | 106 | 39.74 | 11.38 | 412 | 43.05 | 10.04 | -2.950 | 0.003 |
| Curriculum Barriers | 106 | 25.04 | 5.85 | 412 | 25.33 | 5.08 | -0.520 | 0.603 |
| Social Barriers | 106 | 7.25 | 3.22 | 412 | 8.93 | 4.11 | -3.925 | 0.000 |
| Total | 106 | 91.66 | 20.80 | 412 | 97.96 | 18.94 | -2.993 | 0.003 |

Table 12 shows that there were statistically significant differences in the students' experience of online learning in terms of the learning environment, social, and total barriers, in favor of students with no experience of online learning. Nevertheless, there were no statistically significant differences in the students' experience of online learning in terms of teacher or curriculum barriers.

## Interviews with Educational Technology Experts

To answer the seventh research question, interviews were carried out with four faculty members in university Educational Technology Departments. These experts offered many suggestions for overcoming the barriers cited by the students. An important solution that they agreed upon was to use an efficient VLE. This VLE would provide learners with content, instead of sending links via WhatsApp or other apps such as ClassDojo, which was found to make the process more difficult for the learners. Consequently, stress would be reduced for the students and their parents. For example, a VLE should provide learners with both live and recorded classes, assignments, activities, assessments, and a channel of communication with their teachers, as well as between the school and parents. It should likewise contain clear instructions, an outline of the syllabus, and an explanation of the grading strategy to encourage self-learning.

Similarly, it was suggested that e-content be designed using instructional design principles that were expressly intended for online learning, in order to enable students to become active learners. This is because attempting to deliver content as if it is being provided face to face will not facilitate learners' understanding. Moreover, it was suggested that the teacher adopt active learning strategies to engage students in learning, develop their interaction and research skills, and enhance their critical thinking.

Another important suggestion agreed upon by the experts was to maintain channels of communication between teachers and students, such as hotlines, email, or an app. In addition, students should be notified of the specific hours available each day for teachers to answer their questions, which would also reduce learners' sense of loss and isolation. Likewise, schools must train their teachers in effective online teaching strategies because the strategies used in face-to-face teaching are unsuitable for online teaching, and the use of technology in the classroom means more than mere technology adoption.

One educational technology expert suggested that a number of teachers record all lessons to enable learners to select the learning style that suited them. Moreover, explanatory videos or animations should be made available to clarify difficult parts of the syllabus. In addition, each explanation video should be rated: if a video received a high rating, it would indicate that it was understood by the student, and if not, it should be explained again by another teacher. One expert also recommended staggering students' access to the VLE to avoid overloading and crashing the website. Furthermore, a discussion board was proposed, so that the students could communicate and help each other under their teachers' supervision. Another expert proposed that a contingency plan be prepared in case the students were unable to access the VLE. This would allow teachers to open up their own individual channels on social media for communication and explanation. The above expert also recommended that university Educational Technology Departments participate in enhancing teachers' online learning knowledge and skills. Finally, the role of families in assisting the teaching process could be developed through incentives and workshops.

## DISCUSSION AND CONCLUSION

The findings of the current study reveal that this was the parents' first experience of following up their children's learning. However, what made it especially difficult was the lack of attendance records, which reduced the students' seriousness about their learning. It concurs with Al Lily et al.'s (2020) findings, which can be justified as the learners' self-learning skills not being developed previously. Thus, the learners needed supervision. Moreover, there was a lack of parent/school or teacher communication, as supported by Al Lily et al. (2020). This is because such communication took place face to face prior to the COVID-19 pandemic, with no electronic communication involved. Moreover, aside from the negative sequence of this step, some families were unable to provide a computer or high-speed Internet for each of their children, thereby corroborating Al Lily et al.'s (2020) conclusions. For this reason, schools should consider the timing of live-streamed sessions, taking into account the availability of computers for students. Alternatively, schools could record sessions, so that any students who were unable to attend the live sessions could still benefit from them. This result confirms the findings of Assareh and Bidokht (2011), who considered the unavailability of computers to be a barrier to online learning.

Nevertheless, curriculum barriers were the main obstacles cited by the students, due to the large number of assignments allocated and the nature of those assignments, which required students to convene via a limited communication channel in a VLE. This limitation hindered the students from receiving feedback, support, and answers to their inquiries. It corroborates Assareh and Bidokht (2011), who considered vagueness and low VLE quality to be curriculum barriers. Face-to-face content was taught online without being redesigned in accordance with online learning design principles of remote online learning. These barriers have been classed by Mungania (2003) as 'content suitability barriers' since they relate to course content.

The present study findings revealed that the second issue arising from the COVID-19 learning experience related to teachers, who were not trained either before or during the pandemic to design learning content that could be studied online in small chunks to suit different learning styles. Teachers also needed to be in contact with students who might face difficulties in dealing with the VLE or understanding the content. This was reported by Abbasi et al. (2020), who found that these have been reasons for students' negative perceptions of e-learning throughout the COVID-10 pandemic. Moreover, it was an obstacle encountered by online learners in general, as many studies have identified (Mulenga & Marbán, 2020; Mungania, 2003; Schoepp, 2005). These issues were referred to as 'instructional barriers' by Mungania (2003), because they relate to teachers who are usually more confident and comfortable with teaching online courses in their second or third iteration (Hodges et al., 2020).

Another problem facing the students consisted of barriers arising from the learning environment, which included matters related to the 'unified learning system', such as a lack of instructions, difficult navigation, an uninteresting interface, unresponsive website, and disorganized e-content. Moreover, the grading policy was not clear for the students, which caused them confusion and contributed to their lack of motivation and low production, given that they were guaranteed success in their courses. This aligns with Al Lily et al.'s (2020) recommendation to provide guidance for distance education and school management. These barriers have been classified by Mungania (2003) as 'technological barriers'. The unified learning system is a limited VLE that provides students with learning materials through explanatory videos, made available to a large number of teachers in all subject areas. However, as with other VLEs, learners should be able to communicate with their teachers and peers. Moreover, they can learn through augmented reality and games, giving them an opportunity to self-assess their understanding in a wide range of quizzes. Moreover, the learners are required to submit their assignments online and perform various learning activities.

However, the least significant barrier to students' online learning was found to be the social barrier. This indicates high awareness and support from Saudi families, regarding learning in general and online learning in particular, as a formal alternative to traditional learning during the pandemic. Parents therefore provided their children with a suitable environment to study, encouraged them in their learning, and attempted to explain any points that were unclear. These barriers are referred to by Mungania (2003) as 'situational' since they reflect awareness in society.

Specifically, the four barriers were significantly greater for students in public-sector schools than in private schools, because private schools can offer their students more technical and content support. The results also revealed statistically significant differences between male and female students in terms of teacher, learning environment, and curriculum barriers, in favor of the female students. Although male and female students were using the same VLE, the differences may be justified as personal traits or the affordances of certain teachers. These findings are in line with those of Vrazalic et al. (2009) and Aljaraideh and Al Bataineh (2019), where female students appeared to be less excited by e-learning than their male peers, and faced more barriers. However, no differences were found between male and female students in terms of social barriers. This indicates that Saudi families give attention and consideration to both male and female education. However, these results contradict Jung's (2012) findings, as more family and academic support was given to the female students, compared to their male counterparts, who usually had financial problems.

The results revealed that the students who accessed digital devices and the Internet experienced more teacher, learning environment, and social barriers than those who did not. A possible explanation for this is that the more they accessed the Internet and digital devices, the more they faced these issues. Nevertheless, curricular issues were encountered by all the students, with or without access to digital devices or the Internet. The findings likewise revealed that the students who owned a personal computer faced greater barriers of all types than those who did not. This result can be justified as an absence of barriers among those who did not own a personal computer, simply because they did not access the VLE. However, the students with no experience of online learning faced more barriers from the learning environment and society than those who did have such experience. This may be justified by the few students with experience of online learning (6 students) being able to handle barriers relating to the learning environment, since they possibly received support from their schools. However, the other two barriers (teacher and curriculum) were experienced by all the students.

The suggestions offered by the teaching technology experts correspond to those mentioned in the literature. In practical terms, (1) Due to the need for distance education throughout this pandemic, after long resistance, attention should be given by learning institutions to the quality of their remote learning and how prepared they are for its delivery (see also Al Lily et al., 2020). The Saudi Ministry of Education should therefore provide teachers with training courses that focus on the quality and attractiveness of online courses, and on designing online courses that meet students' needs, in consideration of different methods of delivery; (2) Different types of support should be afforded to students (see also Song et al., 2004) to facilitate their VLE access and navigation, and to overcome any barriers that they might face; (3) It is important to provide students with alternative learning resources such as CDs, augmented reality, games, or hotlines for contacting teachers to request one-to-one guidance sessions, thereby steering students towards independent learning (see also Vrazalic et al., 2009), and (4) The establishment of communication channels between schools and students/parents plays an essential role in supporting the learning process (see also Burke and Dempsey, 2020). These channels can be various social networking apps or face-to-face meetings, while at the same time maintaining safety and social distance. To summarize, it is important to follow the online learning design principles as recommended by Ras et al. (2005).

The findings discussed earlier suggest a need to improve the VLEs that are used to teach Secondary school students in Saudi Arabia, so that their learning needs can be met. Such a VLE should have clear instructions, be easy to navigate, have an interesting interface, and contain organized e-content. It is therefore recommended to reconsider the design of content, following distance-learning design principles that can accommodate the circumstances surrounding learners and their families. Moreover, teachers' skills in online teaching metrics should be developed through training sessions. Meanwhile, care should be taken when delivering the curriculum, assignments, and support, so that this provision is suitable for the current learning conditions, where teachers and learners are distant from each other. The current findings imply the importance of including distance-learning design principles in the curriculum for pre-service teachers. In short, further research is recommended to examine these barriers in other educational regions of Saudi Arabia, and among Elementary and Primary school students who might possess different characteristics that can lead to barriers.

To summarize, the recommendations and implications derived from the main findings in this study are as follows:

1. To assist parents who are struggling with their children's lack of commitment, it is important to keep student attendance records and to develop learners' self-learning skills.
2. The lack of parent/school or teacher communication can be overcome by providing different communication channels.
3. The Saudi Ministry of Education, together with other authorities, should provide computers and high-speed Internet access for students who do not currently have access to them, while schools need to consider the timing of live-streamed sessions, or record sessions so that they can be viewed asynchronously.
4. Regarding the curriculum, the number of assignments should be reduced, and the nature of those assignments considered.
5. Teachers should provide instant feedback and support, while also encouraging self-assessment and utilizing various apps to make learning accessible and interesting. Moreover, the VLE should contain clear instructions, a statement of the grading policy, and an interesting interface.
6. Regarding the teacher-related barriers, these could be alleviated by schools providing appropriate teacher-training in the use of educational technology.
7. Parents need to provide their children with a suitable study environment, and to encourage their children's learning, explaining any points that are unclear.

Finally, a number of important limitations need to be considered. First, the small sample of parents and students who were interviewed represents a limitation that could be justified by the timeframe of this study, given that a significant amount of time was required to construct the survey. Secondly, the study participants were from specific schools in a city in Saudi Arabia. Thirdly, the sample was drawn exclusively from Secondary schools, where the students were older, approaching adulthood. Lastly, the time of pandemic that was the focus of the study was from mid of March till the end of the semester at the end of May 2020. Therefore, there may be different barriers facing students in Intermediate and Elementary schools.

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## REFERENCES

Abbasi, S., Ayoob, T., Malik, A., & Memon, S. I. (2020). Perceptions of students regarding E-learning during Covid-19 at a private medical college. *Pakistan Journal of Medical Sciences, 36*(COVID19-S4).

Al Lily, A. E., Ismail, A. F., Abunasser, F. M., & Alqahtani, R. H. A. (2020). Distance education as a response to pandemics: Coronavirus and Arab culture. *Technology in Society*, 101317. https://doi.org/10.1016/j.techsoc.2020.101317

Aljaraideh, Y. & Al Bataineh, K. (2019). Jordanian students' barriers of utilizing online learning: A survey study. *International Education Studies, 12*(5), 99-108.

Almanthari, A., Maulina, S., & Bruce, S. (2020). Secondary school mathematics teachers' views on E-learning implementation barriers during the COVID-19 pandemic: The case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education, 16*(7), em1860. https://doi.org/10.29333/ejmste/8240

Alshammari, T. M., Altebainawi, A. F., & Alenzi, K. A. (2020). Importance of early precautionary actions in avoiding the spread of COVID-19: Saudi Arabia as an Example. *Saudi Pharmaceutical Journal., 28*(7), https://doi.org/10.1016/j.jsps.2020.05.005

Assareh, A. & Bidokht, M. H. (2011). Barriers to e-teaching and e-learning. *Procedia Computer Science, 3,* 791-795.

Benson, A. D. (2002). Using online learning to meet workforce demand: A case study of stakeholder influence. *Quarterly Review of Distance Education, 3*(4), 443-52.

Burke, J. & Dempsey, M. (2020). Covid-19 practice in primary schools in Ireland Report. DOI: 10.13140/RG.2.2.14091.03369

Clark, R. (2002). Six principles of effective e-Learning: What works and why. *The e-Learning Developer's Journal, 6*(2), 1-10.

Conrad, D. (2006). E-Learning and social change: An apparent contradiction. In M. Beaudoin (Ed.), *Perspectives on Higher Education in the Digital Age* (pp. 21-33). New York: Nova.

Dede, C. (1996). The evolution of distance education: Emerging technologies and distributed learning. *American Journal of Distance Education, 10*(2), 4-36.

Gedik, N., Kiraz, E., & Ozden, M. Y. (2013). Design of a blended learning environment: Considerations and implementation issues. *Australasian Journal of Educational Technology, 29*(1).

Hawker, J. (2004). The barriers and solutions for e-learning systems to provide equal access to educational content. *International Journal of the Computer, the Internet and Management, 12*(2), 185-189.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review,* 27 March. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Joseph, R., Alshayban, D., Lucca, J. M., & Alshehry, Y. A. (2020). The immediate psychological response of the general population in Saudi Arabia during COVID-19 pandemic: A cross-sectional study. *medRxiv.* https://doi.org/10.1101/2020.06.19.20135533

Jung, I. (2012). Asian learners' perception of quality in distance education and gender differences. *International Review of Research in Open and Distributed Learning, 13*(2), 1-25.

Lewis-Beck, M., Bryman, A. E., & Liao, T. F. (2003). *The Sage Encyclopedia of Social Science Research Methods.* Sage Publications.

Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). e-Learning, online learning, and distance learning environments: Are they the same?. *The Internet and Higher Education, 14*(2), 129-135.

Muilenburg, L. Y. & Berge, Z. L. (2005). Student barriers to online learning: A factor analytic study. *Distance Education, 26*(1), 29-48.

Mulenga, E. M. & Marban, J. M. (2020). Is COVID-19 the gateway for digital learning in mathematics education?. *Contemporary Educational Technology, 12*(2), ep269. https://doi.org/10.30935/cedtech/7949

Mungania, P. (2003). The seven e-learning barriers facing employees. *Distance Education, 26*(1), 29-48. Perveen, S., Orfali, R., Azam, S., Aati, H. Y., Bukhari, K., Bukhari, S. I., & Al-Taweel, A. (2020). Coronavirus nCOVID-19: A pandemic disease and the Saudi precautions. *Saudi Pharmaceutical Journal, 28*(7), 888-897. DOI: 10.1016/j.jsps.2020.06.006

Ras, E., Memmel, M., & Weibelzahl, S. (2005, April). Integration of e-learning and knowledge management–barriers, solutions and future issues. In *Biennial Conference on Professional Knowledge Management/Wissensmanagement* (pp. 155-164). Springer, Berlin, Heidelberg.

Schoepp, K. (2005). Barriers to technology integration in a technology-rich environment. *Learning and Teaching in Higher Education: Gulf Perspectives, 2*(1), 1-24.

Song, L., Singleton, E. S., Hill, J. R., & Koh, M. H. (2004). Improving online learning: Student perceptions of useful and challenging characteristics. *The Internet and Higher Education, 7*(1), 59-70.

UNESCO (2020). Global monitoring of school closures caused by COVID-19. *UNESCO.* https://en.unesco.org/covid19/educationresponse.

Vrazalic, L., Macgregor, R. C., Behl, D., & Fitzgerald, J. (2009). E-learning barriers in the United Arab Emirates: Preliminary results from an empirical investigation. *IBIMA Business Review, 4*(1), 1-7.

# TEACHERS' SELF-EFFICACY BELIEFS AND OPINIONS ABOUT DISTANCE EDUCATION DURING THE COVID-19 PANDEMIC

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## ABSTRACT

This study investigated teaching self-efficacy beliefs and opinions about distance education of teachers in Turkey who switched to distance education during the COVID-19 pandemic. 758 teachers from Turkey completed an online questionnaire comprising demographic information questions, likert type scale items on self-efficacy for distance education, closed-ended questions addressing teachers' opinions about distance education, and an open-ended question enabling teachers express their experiences with distance education. Data analysis included descriptive statistics, independent samples t-tests, and content analysis. The analysis showed that teachers' beliefs in their own abilities in fulfilling the requirements of distance education, such as organizing effective learning environments and preparing different evaluation activities were not at a high level. The education they received, the active use of technology before the pandemic period and the type of school they work in have effects on teachers' self-efficacy towards distance education. The low number of students attending the live classes negatively affected their motivation. Furthermore, teachers thought that current instructional materials on the platform were not sufficient for students to be successful. However, teachers believed that their experiences in distance education during the pandemic increased their efficiency in education. Most participants received sufficient support from the school administration, but not from

parents during this period. Students' lack of computers and/or internet and systemic errors were among the main problems encountered by the teachers regarding the distance education system. In the study, suggestions were made to make distance education more effective.

**Keywords:** Distance education, teachers' self-efficacy beliefs, COVID-19 pandemic.

## INTRODUCTION

In parallel with the developing pace of technology, changes have occurred in education as in many areas. The development of computer technologies and the transfer of information through the internet have started to occur rapidly. Considering today's education system, it has become evident that various technologies should be utilized and even these technologies should support education. The speed in the production and consumption of knowledge has taken learning out of the understanding of having a fixed space and time, making it possible to learn anytime and anywhere. With the advancing technology, this situation has become increasingly widespread, and in line with the emerging needs, the concept of distance education, which provides equality to people living in different geographies in different conditions, and gives flexibility in space and time, has come to the fore (Aydin, 2017; Bicer, 2019). Distance education, which has many definitions in the literature, is a teaching-learning system that is carried out regularly individually or in groups, where students and teachers in different environments and specially prepared teaching materials are brought together by means of communication technologies (Holmberg, 1995; Isik, Isik, & Guler, 2008). Considering today's conditions, the reason why the concept of distance education has become widespread worldwide is the pandemic period caused by COVID-19.

The first COVID-19 case was reported in China on December 8, 2019 (Wu & McGoogan, 2020) and has since spread almost worldwide. At the time of the article's submission, a total of over 83 million cases were reported in 195 countries worldwide (Digital Transformation Office, 2021). This pandemic has required a dramatic paradigm shift regarding our interactions with each other (Schneider, 2020). One of the first precautionary actions taken in order to control the situation in previous pandemics is the closure of schools (Hens et al., 2009). In the COVID-19 pandemic, many countries have also decided to close schools (Sahu, 2020; Viner et al., 2020; Wang et al., 2020). While some countries preferred to postpone the spring semester of the 2019-2020 academic year to the next semester, some countries chose to use systems that enable distance education to continue education (Domenico et al., 2020; Viner et al., 2020).

In this process, the biases and attitudes of teachers and students who are used to face-to-face education affect their distance education experiences. Difficulties may arise due to problems such as students and teachers not being competent enough in technology and lack of infrastructure in platforms offering distance education. Administrators with insufficient experience and knowledge in this area may have limited support for teachers and students. On the other hand, administrators who are open to technological developments can lean towards distance education and lead the way in interacting with individuals in online environments (Telli Yamamoto & Altun, 2020).

This unplanned and unprecedented crisis towards society and education has suddenly and in many ways altered the work of many teachers (Fagell, 2020; Pirtle, 2020). During this period, school buildings were closed, and education moved to the online platform (Van Lancker & Parolin, 2020). Teachers had to move quickly to unconventional teaching methods and find ways to communicate with their students. Whether referred to as distance learning, online or virtual learning, teachers have had a hard time providing meaningful educational experiences to all their students in this process (De Witt, 2020; Merrill, 2020). These types of learning and teaching are not new but are new to many teachers, and teacher's roles have changed during the crisis. Being forced to work from home, the fact that the existing lesson plans were not enough anymore, being forced to learn new technologies quickly, and being separated from their students, many teachers have experienced the most traumatic and transformational event of the modern age (Baired, 2020).

One of the important motivational concepts about teachers is teachers' self-efficacy beliefs. Teachers' self-efficacy beliefs are teachers' judgments about their ability to fulfil teaching-related tasks (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Teachers' self-efficacy beliefs are very important, as they are closely related to teaching behaviours like using various teaching methods (e.g. Woolfolk, Rosoff, & Hoy, 1990) and student outcomes like an academic achievement (e.g. Caprara, Barbaranelli, Steca, & Malone, 2006). Factors such as the education teachers receive (Ross, 1994) and the support they receive from school administration (Larrick, 2004) have an effect on their self-efficacy beliefs.

Due to the COVID-19 outbreak, teachers had long-term distance education experience during this period. In this context, the need to examine teachers' self-efficacy beliefs about distance education has emerged. The purpose of this study is to determine the level of teachers' self-efficacy in distance education in Turkey, one of the countries making the transition to distance education due to the pandemic and to determine whether teachers' self-efficacy is affected by factors such as the education they receive, the type of school they work, the school administration and the support from parents. In addition, it was aimed to examine teachers' views on distance education and how they were affected by distance education.

## Distance Education

The distance education approach was actually applied by some organizations in the United States of America in the 19th century by using a correspondence teaching tool. At the beginning of the 20th century, several major universities in Australia started distance education. Towards the end of the 20th century, distance education practices were also seen in Asian, African and South American countries. Today, depending on the development of belief in education, the spread of democracy and the advancement of technology, distance education is significantly developed and widely applied all over the world (Ozer, 1999).

In Turkey, the first open education faculty at university level was established within Anadolu University in 1982 (Anadolu University, 2021). In the 1990s, internet and web technologies came to the fore more, and distance education applications became much more comprehensive with the advantages of the internet (Kirik, 2014). In 2000, the first distance education courses accredited by Council of Higher Education were opened in Middle East Technical University and Firat University (Varol, 2001). Today, nearly 80% of the existing higher education institutions in our country provide education at various certificate, associate degree, undergraduate and graduate levels with distance education practices (Ozbay, 2015) and distance education has been implemented widely in middle school, high school and higher education (Cukadar & Celik, 2003).

The distance education process is student-centred, and there is a cooperation between the teacher and the student in this process. Students contribute to their own learning by taking an active role (Galusha, 1998). In distance education, students can progress at their own pace; they can check the way they learn, the content, goals and criteria of the subject they learn, and evaluate what they have learned (Kaya, 2002). One of the most critical components of the distance education process is undoubtedly teachers. The teacher is the one who uses and manages the system in virtual classroom education. Although distance education is a process in which the student should take responsibility, it is the teacher's duty to design material for the class, to control and manage the student in this process, and to provide various tools for educational achievements (Aydin, 2017; Yildiz, 2015).

As mentioned earlier, distance education is not a new concept, but COVID-19 has revived the need to explore teaching and learning opportunities online (Almaiah, Al-Khasawneh, & Althunibat, 2020). Different countries around the world have brought various solutions to continue the education process during the pandemic. Online libraries, TV broadcasts, guides, resources, video lectures, online channels have been promoted in at least 96 countries. For example, in Georgia, the Ministry of Education (MONE), Science, Culture and Sports, launched the educational project "Teleskola" (TV School) in cooperation with the first channel of the Georgian public broadcast to increase the coverage of school classes. The classes across the country were broadcasted live on the TV channel (Basilaia & Kvavadze, 2020). The Ministry of Education in the Philippines launches the DEPED Commons Project to serve as an online platform for students across the country to participate in virtual classes (Talidong & Toquero, 2020).

Immediately after the closing of the schools in Turkey on 16th of March in 2020, distance education activities began in a short time as a week. TRT EBA channels were opened on television and internet to access by every child. Extensions were made in this process to ensure equal opportunities. Later on, the EBA platform started to be taught synchronously by switching to live classroom applications. It was aimed to make the process efficient by using various instructional materials such as animation and virtual laboratories during the live classes. In addition, the tests solved to measure student performance in the distance education process were systematically followed. However, in the second term of the 2019-2020 academic year, there were no written/oral exams during the semester to be included in the report cards, the first term report card grades were valid in the second term report cards, and they were sent to the students electronically (Ministry of Education, 2020a)

Recently, many studies (e.g. Bakioglu & Agile, 2020; Cakin & Kulekci Akyavuz, 2020; Kaden, 2020) have been conducted to determine the effects of the COVID-19 pandemic on education. For example, in a case study examining the changes in the professional life of a secondary school teacher who switched to online education with the closure of their school during the pandemic period in rural America, and the effects on teaching and workload, it is seen that although the workload of the teacher increased, all students, especially poor and disabled students seemed inaccessible to participate in online education (Kaden, 2020). In a phenomenology study on the experiences of science teachers in distance education in Turkey (n= 75) were investigated in-depth (Bakioglu & Agile, 2020). It was found that among the difficulties faced by teachers in distance education during the pandemic, were the problems with an internet connection, inability to communicate with students, the low number of students attending classes and the pressure of the school administration. On the other hand, it was determined that this process has positive effects in terms of using educational technologies and professional development. In another phenomenology study in Turkey, it was found that the primary teachers (n= 20), had communication problems in distance education during the COVID-19 period, problems with the parents and issues with students' learning (Cakin & Kulekci Akyavuz, 2020).

## Teacher Self-Efficacy

The concept of self-efficacy, which we come across in Bandura's Social Learning Theory, is related to the belief in one's own abilities to successfully complete a task assigned to them (Bandura, 1986). Self-efficacy beliefs are effective in determining individuals' feelings, thoughts, motivation and behaviour. People with high self-efficacy beliefs behave very decisively in achieving their goals. They can increase their personal satisfaction and success by quickly overcoming the difficulties they encounter as a result of failure or defeat. On the other hand, individuals with low self-efficacy beliefs avoid doing hard work that may cause tension, stress and discontent, they do not make any effort and may give up quickly (Bandura, 1999). Considering these explanations, self-efficacy emerges as an important concept in all areas of life. The teaching profession is one of these areas.

Teachers' self-efficacy beliefs are their judgments about teaching abilities, using teaching strategies, being effective in classroom management, and ensuring student participation (Tschannen-Moran & Woolfolk Hoy, 2001). Teachers with high self-efficacy are more eager in the learning-teaching process (Tuckman & Sexton, 1990) and are more successful in classroom management (Gibson & Dembo, 1984). Teachers' self-efficacy beliefs increase students' motivation to learn and raise their self-perception to a higher level (Midgley, Feldlaufer, & Eceles, 1989). In addition, there is a high positive relationship between teacher self-efficacy beliefs and student achievement (Allinder, 1995; Ross, 1994). Teachers' self-efficacy beliefs are also related to the choice of method and the time dedicated to teaching. Strong self-efficacy beliefs of teachers directly increase the quality of teaching. In addition, a strong sense of self-efficacy can personally enable the teacher to perform their profession with higher satisfaction and to do it in a healthy way (Cakiroglu & Isiksal, 2009).

Teachers' self-efficacy beliefs are associated with several factors such as school climate, interpersonal interaction, barriers to effective teaching, teacher empowerment, and school administrators' leadership behaviour (Armstrong-Coppins, 2003; Bandura, 1997; Tschanen-Moran, Woolfolk Hoy & Hoy, 1998). For example, Hoy and Woolfolk (1993) attributed the increase in teachers' self-efficacy beliefs to the conditions of having high but achievable goals, a serious and orderly learning environment, and academic respect for excellence. School principals undoubtedly have an important role in creating these conditions. It is also important for school principals to appreciate and reward teachers' efforts and achievements (Larrick, 2004).

Bandura (1997) emphasizes the leadership and empowerment of teachers in strengthening their self-efficacy perceptions, as a matter of fact, teachers who gain leadership and feel the power of authority feel that they are competent in classroom management.

Several empirical studies have been conducted on self-efficacy issue (e.g. Blonder et al., 2013; Lee & Tsai, 2010). For instance, Compeau and Higgins (1995) found that Canadian managers' and professionals' computer self-efficacy influences their actual computer use. In another study, Lee and Tsai (2010) found that teachers in Taiwan schools, ranging from elementary to high school, lacked technological pedagogical content knowledge related to web but reported high levels of self-efficacy regarding their general use of web. Blonder et al. (2013) showed that a professional development program improved high school chemistry teachers' efficacy beliefs in integrating videos in their chemistry teaching.

The unexpected COVID-19-related disruptions to primary and secondary education created the need to research and document significant changes in teaching practices and teachers' responsibilities (Yang, 2020). Therefore, during the COVID-19 pandemic, it is very important to investigate self-efficacy beliefs of teachers towards distance education. In a qualitative study conducted in Turkey, it was concluded that materials, teaching methods and techniques used by science teachers in their classes changed in this period and they came to the conclusion that they feel inadequate about themselves in distance education (Bakioglu & Agile, 2020).

## Purpose of the Study

This study aims to determine (i) the level of distance education self-efficacy beliefs of teachers, (ii) factors influencing distance education self-efficacy of teachers, (iii) teachers' opinions about distance education and (iv) the effects of distance education on teachers in Turkey in the process of COVID-19 pandemic. The questions for which answers are sought in the research are as follows:

1. What are the distance education self-efficacy levels of teachers?
2. Do teachers' distance education self-efficacy differ according to the education they received (educational status, whether or not they receive an education on distance education in university and in-service training), the type of school they work in and their active use of technology in their classes before the pandemic period?
3. What are the teachers' views on the efficiency of distance education and live class (the percentage of students attending a live class, the suitability of the class topics to be taught with the live class, the adequacy of the current instructional materials on the platform, the contribution of live class to students' meaningful learning, the comparison of the efficiency of the live class and face-to-face education, whether teaching with live classes is as enjoyable as face-to-face education, the educational success of the current distance education system)?
4. What are the teachers' opinions on the support they receive from the school administration and parents in the distance education process?
5. What are the effects of distance education on teachers (the effect of the number of students attending the live class on their motivation, whether they find the interaction with the computer system annoying, the economic effect of distance education, the effect of their experiences in distance education during the pandemic process on their educational efficiency)?

# METHOD

## Research Design

Survey method was used in the study. The survey method aims to explain individuals' attitudes, opinions, beliefs, demographic characteristics, habits and wishes (Creswell, 2011). In this study, it is used to determine the views on distance education and distance education self-efficacy beliefs of teachers who experienced distance education in Turkey during COVID-19 pandemics period. The study data were collected through an online questionnaire in May and June 2020, and participation in the study was voluntary.

## Participants

The sample of the study consists of teachers from different branches who actively teach in a public and private school in Turkey, experiencing the distance education during the COVID-19 pandemic in the spring semester of 2019-2020 academic year. In the study, a total of 758 teachers from 55 different provinces of Turkey and from 24 different branches participated. Participants' experience in the profession is average of 9.83 (SD= 7.24) years. The majority of the teachers (85.4%) stated that they did not receive any training in distance education in university life, and 14.6% of them stated that they received training on this subject. Similarly, teachers who do not receive in-service training on distance education dominate; 78.5% of them did not receive in-service training on this subject, and 21.5% of them did. Other demographic information of the sample is presented in Table 1.

**Table 1.** Demographic information of the sample

| | | Frequency | % |
|---|---|---|---|
| Gender | Female | 570 | 75.6 |
| | Male | 184 | 24.4 |
| | Missing | 4 | 0.5 |
| Faculty graduated in the university | Faculty of Education | 592 | 78.1 |
| | Faculty of Arts and Sciences | 105 | 13.9 |
| | Faculty of Engineering | 12 | 1.6 |
| | Other | 49 | 6.5 |
| Educational status | Bachelor's degree | 631 | 83.2 |
| | Post-graduate | 113 | 14.9 |
| | Doctor's degree | 14 | 1.8 |
| Type of school | Public school | 713 | 94.1 |
| | Private school | 45 | 5.9 |
| Settlement of the school | City center | 392 | 51.7 |
| | District | 225 | 29.7 |
| | Town | 11 | 1.5 |
| | Village | 130 | 17.2 |

## Data Collection Tools

As a data collection tool, an online questionnaire form consisting of three parts was used. In the first part of the questionnaire, there were questions about gender, faculty from which they graduated, educational status, type of school, settlement of the school, whether they have received any education on distance education in university life and in-service education to determine the demographic characteristics of teachers.

In the second part of the questionnaire, a unidimensional scale developed by Yildiz (2015) to determine the self-efficacy perceptions of instructors towards distance education was used to determine the distance education self-efficacy of teachers. Since the scale was developed for teaching staff, confirmatory factor analysis was performed using the LISREL 8.8 program (Joreskog & Sorbom, 2007) to test its suitability to the sample group consisting of teachers. The goodness of fit indices obtained from the analysis showed that the data set fit well with the proposed structure (S-RMR = .056, NNFI = .932, CFI = .947, IFI = .947). There are ten items in the scale and are answered in a 5-point Likert type (1= not sufficient at all, 5 = very sufficient). The scale requires the participants to evaluate the ability to use tools such as computers and cameras required by the distance education system, to use components such as forums and messages, to integrate the technologies they deem necessary into their class, to solve the problems they encounter, to organize various instructional materials and teaching activities for effective class environments, to prepare different assessment and evaluation activities and their belief in their abilities to provide classroom management in virtual classrooms. In this study, the Cronbach alpha coefficient of the reliability of the scores obtained in the scale items was .95.

In the third part of the questionnaire, 18 closed-ended questions, mostly with yes/no options, and an open-ended question that allows teachers to express their opinions about their distance education experiences were used. The questions in this section were developed by the researchers and are given in the Appendix. The relevance of the items in terms of content was examined by two faculty members. One of the faculties was from department of computer and instructional technologies education and the other was from department of mathematics and science education. In order to evaluate the items in terms of spelling and clarity, the opinions of three Turkish teachers were consulted. The items were arranged according to the feedback received. The questionnaire was delivered to 30 teachers via e-mail for pilot application. In general, there was no problem in the pilot implementation, some changes were made in some items, and the final version of the questionnaire was decided.

### Data Analysis

The SPPS 23 program was used in the analysis of the data obtained from the closed-ended questions and scale items of the questionnaire. Descriptive statistics were used to determine teachers' distance education self-efficacy levels (research question 1), teachers' views on distance education and the efficiency of live class (research question 3), teachers' opinions about the support they receive from school administration and parents in the distance education process (research question 4), and the effects of distance education on teachers (research question 5).

Five separate independent samples t-tests were conducted to evaluate whether the distance education self-efficacy of teachers differentiates according to their education (educational level, whether they received an education about distance education in university life and in-service education), the type of school they work in and their active use of technology in their classes before the pandemic period (research question 2). The results were evaluated using Bonferroni adjustment to reduce the possibility of falling into type-1 error.

Content analysis was used in the analysis of the answers given to the open-ended question in the questionnaire. Two of the authors of the study examined participants' responses and formed codes and categories individually. Later, these researchers came together to see if there was a consistency between codes and categories. It was observed that there was consistency in most of the analysis, and the points where there were differences were discussed and agreed upon, that is full agreement was reached. Then another author of the study examined the analysis, and the codes and categories were finalized.

## FINDINGS

### Distance Education Self-Efficacy of Teachers

When the responses of teachers who teach distance education during the pandemic to the distance education self-efficacy scale ($M= 3.61$, $SS= .68$) are examined, teachers believe that that they are partially sufficient or sufficient to use the tools required by the distance education system such as a computer, camera, sound system, and use system components such as forums and messages; to be able to integrate the technologies they deem necessary into their class, to be able to manage the classroom in virtual classrooms and solve the problems they encounter in the distance education system, to organize effective course environments, to prepare various instructional materials, and to prepare different assessment and evaluation activities. Teachers' responses to the questionnaire items also support this result. More than half of the participants (52.0%) think that they cannot easily create a classroom environment and teach in any situation through the live class. The rate of teachers who think that they cannot perform assessment and evaluation effectively in distance education is 73.1%. These results show that teachers' belief in their own abilities in fulfilling the requirements of distance education is not at a high level.

## The Effects of Active Use of Education, School Type and Technology on Distance Education Self-Efficacy of Teachers

Five independent samples t-test were conducted to determine whether the distance education self-efficacy of teachers differentiates according to their education (educational status, university life and whether or not they received an education on distance education in in-service training), the type of school they work in, and their active use of technology in their classes before the pandemic period. By using Bonferonni adjustment (.05/5), the results were evaluated with an alpha value of .01 (See Table 2).

According to the results, teachers who have a post-graduate education degree have higher self-efficacy than teachers who have graduated from undergraduate education, teachers who received a distance education training in the university have higher self-efficacy than teachers who did not receive a distance education training in university, and teachers who received a distance education training in in-service education have higher self-efficacy than teachers who did not receive a distance education training in in-service education. This situation supports that the education teachers receive has positive effects on their distance education self-efficacy.

When the distance education self-efficacy of teachers is compared according to the type of school they work in, it is seen that teachers working in private schools have higher levels of self-efficacy than teachers working in public schools. Teachers who actively use technology in their classes before the pandemic period also have higher self-efficacy beliefs in distance education than teachers who do not use it. The calculated eta square effect size values are small according to Cohen (1988)'s criteria.

**Table 2.** Comparison of teachers' self-efficacy towards distance education according to the education they received, the type of school they work in and active use of technology before the pandemic period

| Group | N | M | SD | t | df | p | Eta square |
|---|---|---|---|---|---|---|---|
| Having a bachelor's degree | 631 | 3.57 | .68 | -4.04 | 756 | .00 | .02 |
| Having a post-graduate education degree | 127 | 3.84 | .67 | | | | |
| Receiving distance education training in university | 111 | 3.91 | .62 | 5.05 | 756 | .00 | .03 |
| Not receiving any distance education training in university | 647 | 3.56 | .68 | | | | |
| Receiving distance education training in in-service training | 163 | 3.89 | .63 | 5.96 | 756 | .00 | .04 |
| Not receiving any distance education training in in-service training | 595 | 3.54 | .68 | | | | |
| Working in a public school | 713 | 3.59 | .69 | -4.74 | 54.17 | .00 | .03 |
| Working in a private school | 45 | 3.98 | .52 | | | | |
| Actively using technology in their classes before the pandemic | 590 | 3.69 | .66 | 5.72 | 756 | .00 | .04 |
| Not actively using technology in their classes before the pandemic | 168 | 3.35 | .68 | | | | |

## Teachers' Views on the Efficiency of Distance Education and Live Classes

More than half of the teachers (59.5%) stated that the class size of the students attending the live class was between 1% and 25% (see Figure 1). The rate of teachers (5.67%) who stated that more than 75% of the students in their classes attend the live class was quite low. All of the participants stated that the number of students attending the live class was low. According to the teachers, the most suitable time for the live class was 11:00-13:00 (37.9%), 13:00-15:00 (30.1%) and 9:00-11:00 (20.3%).

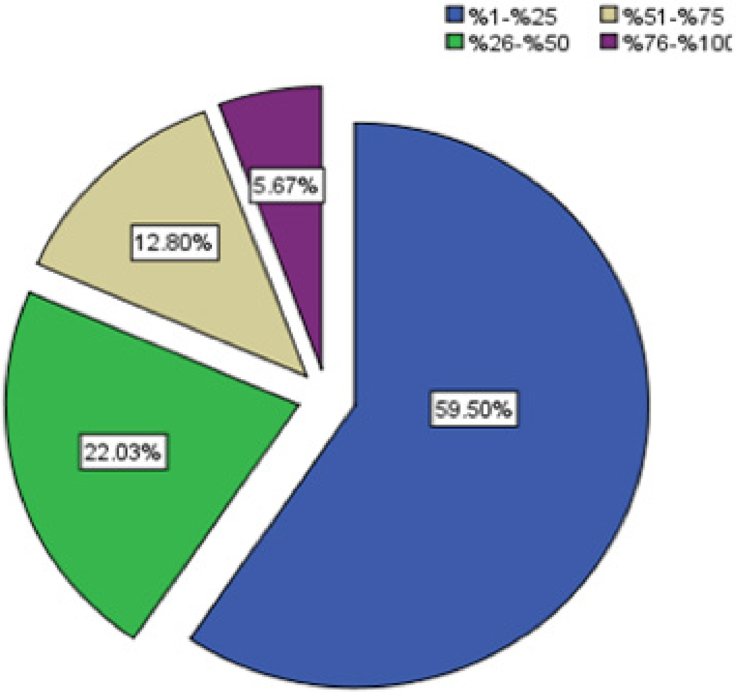


**Figure 1.** The proportion of students attending the live course

Approximately half of the participants found the course subjects suitable for teaching with live classes, while the other half did not find it appropriate. Majority of the teachers (79.02%) did find the current instructional materials on the platform sufficient in order for the students to be successful. On the other hand, 41.69% of the teachers thought that live classes contributed to students' meaningful learning, while 58.31% did not agree with this. While only 6.46% of the teachers thought that the classes taught through live classes were as efficient as face-to-face education, the vast majority (93.54%) disagreed with this. The rate of teachers who found teaching with live classes more enjoyable than teaching with face to face was quite low (8.18%). Nearly half of the teachers (44.46%) found the current distance education system educationally successful, while 55.54% did not find it successful (See Table 3).

**Table 3.** Teachers' opinions about the efficiency of distance education

| | Yes (%) | No (%) |
|---|---|---|
| The suitability of the class subjects to teach with live class | 49.47 | 50.53 |
| Sufficiency of the instructional materials available on the platform | 20.98 | 79.02 |
| Live classes contributing to students' meaningful learning | 41.69 | 58.31 |
| Live classes are as efficient as face-to-face education | 6.46 | 93.54 |
| Finding the teaching of live classes more enjoyable than face-to-face education | 8.18 | 91.82 |
| Finding the current distance education system educationally successful | 44.46 | 55.54 |

## Teachers' Opinions about the Support They Receive From the School Administration and Parents

Teachers were asked about the support they received from the school administration and parents during distance education. About three-quarters of the teachers stated that they received sufficient support from the school administration in the distance education process, while rest of them did not. Slightly more than half of the teachers received support from their institution to solve the technical problems they encounter in live classes. One fourth of the teachers stated that they received sufficient support from parents in the distance education process, while the vast majority reported that they did not receive sufficient support from parents in this process (See Table 4).

**Table 4.** Teachers' opinions about the support they receive during distance education

| | Yes (%) | No (%) |
|---|---|---|
| Receiving sufficient support from the school administration in the distance education process | 71.14 | 25.86 |
| Receiving support from the institution for technical problems faced during live classes | 55.41 | 44.59 |
| Receiving sufficient support from parents in the distance education process | 25.20 | 74.80 |

## Effects of Distance Education on Teachers' Motivation, Economic Situation and Efficiency in Education

Effects of distance education on teachers were also focused. 80.21% of the teachers stated that the fact that the number of students attending live classes is less than the class size negatively affects their motivation as a teacher. Besides, 42.74% of the teachers find the interaction with the computer system annoying. When examining the economic impact of distance education on teachers, one-fourth of the teachers (25.20%) reported that distance education imposed an economic burden on them. On the other hand, the rate of teachers (69.39%) who thought that their experiences in distance education during the pandemic increased their efficiency in education was high (See Table 5).

**Table 5.** Effects of distance education on teachers

| | Yes (%) | No (%) |
|---|---|---|
| Negative effects of the few student participation in the live classes on their motivation | 80.21 | 19.79 |
| Finding interaction with the computer system annoying | 42.74 | 57.26 |
| Economic burden of distance education | 52.20 | 74.80 |
| Increasing the efficiency of their experiences in distance education | 69.39 | 30.61 |

In the last question of the questionnaire, an open-ended question that reads "please write if there is anything else you want to add about your distance education experiences" was asked to the teachers and 198 teachers answered this question. Content analysis was performed on the answers given, and codes and categories were created (Table 6).

**Table 6.** Teachers' opinions on their distance education experiences

| Category | Code | Frequency |
|---|---|---|
| **System errors and infrastructure problem** | Students not having a computer and/or internet | 42 |
| | Systemic errors (system dismissals, interruption of classes, etc.) | 25 |
| | Lack of infrastructure | 10 |
| | Internet infrastructure problem | 3 |
| | Inadequate internet quota | 3 |
| | Teachers not having a computer and/or internet | 3 |
| **The efficiency of distance education** | Not as efficient as face-to-face training | 42 |
| | Not being effective alone | 5 |
| | Not suitable for younger students | 3 |
| | Not suitable for special education students | 1 |
| **Inequality of opportunity in education** | Causes inequality of opportunity in education | 23 |
| | Inequality of opportunity for students with no financial means | 13 |
| | Inequality of opportunity for students in rural areas | 11 |
| | Not all students can benefit | 2 |
| **Problems caused by school administration and MEB** | Teachers' course load, working hours and responsibilities increase | 10 |
| | Weak EBA course content/lack of documentation | 4 |
| | School management not supporting teachers | 3 |
| | Pressure implemented by the school management | 2 |
| | Ignoring the suitability of class hours to the teacher | 1 |
| | Institutions not taking part in the preparation of class slides | 1 |
| **Problems with student attendance and motivation** | Low student participation | 18 |
| | Low student motivation | 2 |
| **Teacher-related problems** | Teachers' lack of knowledge and experience in distance education/need for in-service training on distance education | 9 |
| | Teachers are not familiar with technology | 4 |
| | Low teacher motivation | 3 |
| | Indifference and irresponsibility of teachers | 2 |
| **Problems with the live class** | No obligation to attend | 6 |
| | Difficulty teaching math classes | 3 |
| | Turned-off student cameras | 3 |
| | Limited assessment and evaluation | 2 |
| | Difficulties in classroom management | 2 |
| | Not staying in classes | 1 |
| | Short class time | 1 |

| | | |
|---|---|---|
| **Parent-related problems** | Parents' lack of interest | 9 |
| | Parents not knowing about distance education | 3 |
| | Parents intervening too much | 1 |
| **Positive aspects of distance education** | Increasing teachers' experience about distance education | 5 |
| | Students stay in the education process | 4 |
| | Can be used as support when returning to face-to-face education | 2 |
| | Students gain experience in distance education | 1 |
| | Giving a different perspective on education | 1 |

It was observed that teachers primarily drew attention to the systemic mistakes and infrastructure problems they experienced in distance education. The main problems were students' lack of computers and/or internet (f=42), systemic errors (f=25) such as the dismissal of the system and interruption of courses, and lack of infrastructure (f=10). The opinion of a teacher on this subject is as follows:

Logins to the system are not easy. According to the information we obtained from the students, there were those who could not try to log into the system for hours. The infrastructure needs to be improved. The system can kick us during the class, and sometimes we can't even enter the class. Students do not attend the class; they do not do the given homework. The system constantly ranks teachers according to the time, but there is no activity in the system which we can spend 5-6 hours on.

Referring to the issue of the efficiency of distance education, teachers think that distance education is not as efficient as face-to-face education. One of the participants expressed their opinion on this issue as follows: "Even the best distance education cannot be as beneficial as face-to-face education." (T:714)

Teachers reported that distance education application causes inequality of opportunity in education. Teachers stated that it mainly causes inequality of opportunity in education (f=23), there is no equality of opportunity for students who do not have financial means (f=13) and students in rural areas (f=11). One of the teachers expressed their opinion on this issue as follows: "Since most of my students come from the village, we had great difficulties and injustice in education emerged. Great gaps were created between the student having all the opportunities in the city center and the village students. This situation has worn us and our students psychologically" (T:491). Another teacher wrote:

Some students must have the necessary technological equipment to benefit from this process (phone, tablet, PC, internet, etc.). However, unfortunately, students living in rural areas could not benefit from the distance education process effectively because they were deprived of these equipment. (T:736)

In the distance education process, it was observed that teachers had problems related to school administration and MONE. Teachers stated that the distance education process was tiring for them due to the increase in their responsibilities such as the increase in the course load and working hours and the need to communicate with parents, administration and students continuously (f=10). Lack of EBA course content/lack of documents (f=4) and the school administration's lack of support for teachers (f=3) are among the other problems they experienced. The statements of some teachers regarding this subject are as follows: "It is a very tiring and difficult process" (T:13). "I believe that the school administration has worn down teachers in this process, instead of increasing teacher motivation, some sanctions that stress teachers are applied, and this needs to be resolved." (T:236)

It is observed that there are problems with student participation and motivation in distance education. One of the teachers, who stated that student participation was low (f= 18), added "The biggest problem is low participation" (T:193). Another teacher expressed their views as follows:

Unfortunately, as a teacher working in village conditions, I can say that it is not a system that every student can benefit from. We have students who live in many villages, but they do not have internet infrastructure in their villages, their phones do not have any reception, they do not have computers, and they can only participate in the class if their parents are at home. The number of students who can attend a class does not exceed 3 out of 35 people. We are constantly experiencing disconnections; in such a case, it is not possible to talk about the efficiency of the course. Under the conditions, this is the best of a bad lot, but as I said, some improvements must be made for a system that every student can benefit from. (T:231)

When the answers of the participants are examined, it is seen that there are also problems with the teacher. Teachers 'lack of knowledge and experience in distance education/ their need in in-service training on distance education (f= 9) and the fact that they are unfamiliar with the technology (f= 4) are among the main problems mentioned. While one teacher said, "we would have been more efficient if we had received his education beforehand" (T:284), another teacher expressed their thoughts as follows:

During the distance education process, a compulsory seminar should be given to each teacher on subjects such as creating live course material and using material during the live class. Each teacher strives to learn something in this process with his own efforts, and unfortunately, most of the information we learn is hearsay. We all need more professional help in this regard. (T:307)

It is observed that teachers also have problems with live classes. Some teachers emphasize that attendance should be mandatory (f= 6). A teacher wrote the following on the subject: "I think it will be a successful system provided that attendance is mandatory when students have sufficient equipment for distance education." (T:726)

Mentioning that problems with parents were also experienced during the distance education process, teachers pointed out that parents were indifferent (f= 9) and ignorant about distance education (f= 3). The statements of two of the teachers who voiced this issue are as follows: "It is a big problem that parents have trouble about the internet and cannot fully control the subject" (T:73). "Too many parents who do not adapt to technology, the indifference of parents" (T:500).

There were also participants who stated that distance education has positive aspects. The main positive effects are the increase in teachers 'experience about distance education (f= 5) and the fact that students continue to stay in the education process (f= 4). Two teachers expressed their views on this issue with the following sentences: "… I think it is a process that breaks prejudices and gives us all the familiarity with the educational use of technology. In this respect, it is a nice experience" (T:551). "Having distance education during the pandemic period has been very good for children not to break away from education. However, no technology can replace face-to-face education" (T:609). In general, it was observed that the teachers' responses to the open-ended question of the questionnaire coincided with their answers to the closed-ended items.

## DISCUSSION AND CONCLUSION

In this study, (i) the AND level of distance education self-efficacy beliefs of teachers who switched to distance education, (ii) factors affecting distance education self-efficacy beliefs, (iii) teachers' views on distance education and (iv) the effects of distance education on teachers in Turkey during the COVID-19 pandemic were examined. In the first question of the study, the distance education self-efficacy levels of the teachers were discussed. In distance education, it has been observed that teachers' beliefs in their own abilities are not at a high level in fulfilling the requirements of distance education such as organizing effective class environments in the system, solving the problems they encounter, preparing different assessment and evaluation activities. Similar findings in other studies conducted in Turkey have been obtained. It has been found that science teachers who provided distance education during the COVID-19 period had problems with software/hardware, internet connection, computer programs, computer accents and not knowing how to use the computer (Bakioglu & Cevik, 2020). According to the report published by UNESCO (2020a), during the COVID-19 period, teachers had to be quickly involved in the distance education process without taking their ideas and providing the necessary training and faced with pressures to use distance education methods and tools. In the report, it was emphasized that teachers should be informed and supported on these issues. As a matter of fact, in a study conducted in Slovenia at the beginning of COVID-19, it was found that teachers with higher self-efficacy in information and communication technologies have more positive attitudes towards distance education (Košir et al., 2020). These results show that teachers' distance education self-efficacy should be supported.

In the second question of the study, the factors affecting the distance education self-efficacy beliefs of teachers were examined. According to the teachers who have a post-graduate education degree; It was observed that teachers who received a distance education training in university had higher self-efficacy than teachers who did not, and teachers who received training on distance education in in-service training had higher self-efficacy than teachers who did not. This shows that the education teachers receive has positive effects on their distance education self-efficacy. However, it was determined that the majority of teachers (85.4%) who did not receive any training in distance education during university and did not attend in-service training (78.5%) on this subject. In the answers they gave to the open-ended question of the questionnaire, there were teachers who stated that they did not have knowledge and experience in distance education and that they needed in-service training on this subject. In her study, Iwai (2020) reported that with the sudden transition to platforms used in distance education in the COVID-19 pandemic, especially educators who are less equipped on the internet and computers, have difficulty in managing virtual classes mediated by a screen and microphone. These results indicate that it is important to support teachers by improving their knowledge and skills in distance education through trainings to strengthen their self-efficacy in distance education.

In the study, it was determined that teachers who actively used technology in their classes before the pandemic period had higher self-efficacy beliefs in distance education than teachers who did not use it. When the distance education self-efficacy of the participants was compared according to the type of school they worked, it was found that teachers working in private schools had higher levels of self-efficacy than teachers working in public schools. The reason for this may be that private school teachers are more accustomed to using technology in their teaching, as the technological facilities of private schools are better than public schools. Another reason may be that the support provided by the school administration and parents to teachers for distance education in private schools is better than in public schools. In her article on this subject, Winter (2020) shared an article in which a teacher working at a private school in Italy during the COVID-19 process wrote about his experiences during this process. This teacher stated that all children have tablets in the school where she works and that the students studying at the public school are educated through written documents prepared by the teachers and delivered to their parents.

In the third question of the study, teachers' opinions about the efficiency of distance education and live classes were analyzed. All of the teachers stated that the number of students attending live classes was low. Similarly, in the analysis of the responses of the teachers to the open-ended questionnaire item, it was found that student participation and student motivation were low in the distance education process. Similarly, it has been demonstrated in other studies conducted during the pandemic period that students' participation in online or offline classes is low (e.g. Bakioglu & Cevik, 2020). Among the reasons for the low participation of students in live classes, there may be reasons such as the lack of internet infrastructure in the student's residential area, lack of equipment due to economic reasons, the lack of interest of parents, the disappearance of the class not passing by the Ministry of Education, and the thought that the efficiency of face-to-face education cannot be obtained in distance education. As a matter of fact, in the responses of teachers to the open-ended questionnaire, students' lack of computers and/or internet and systemic errors (dismissing the system from the course, interruption of the classes etc.) are among the most common problems. In addition, some teachers stated that distance education causes inequality of opportunity for students in rural areas and without financial means.

In other studies, the fact that the system infrastructure is not sufficient, not every student has educational materials such as computers and tablets (Basaran, Dogan, Karaoglu, & Sahin, 2020) and all students, especially poor and disabled students, cannot be reached to participate in online education (Kaden , 2020) have emerged as situations that complicate and negatively affect the process. In this study, again, according to the answers given by the teachers to the open-ended questionnaire item, the absence of attendance obligation causes students to have less participation in live lessons.

According to the findings obtained in the study, half of the teachers stated that subjects were suitable for teaching through live classes, while the other half stated that it was not. According to the responses of the teachers to the open-ended questionnaire, some teachers think that it is difficult to teach math classes in the live classes. This situation may be caused by factors such as the content of the course and the teacher's computer literacy. While lessons with verbal content such as Turkish, Social Studies, History can be taught more easily in the distance education process, it can be difficult to teach classes that require practice such as Science, Physics, Chemistry, due to the lack of time, space and material limitations. At the same time, it can be thought that teachers who are qualified to use information technology find their classes suitable for teaching with live classes. As a matter of fact, Ustun, Karaoglan Yilmaz and Yilmaz (2020) emphasized the importance of improving teachers' self-efficacy in using information and communication technologies for their success in distance education environments.

According to another result reached in this study, most of the teachers (79.02%) do not find the current instructional materials on the platform sufficient for the students who receive distance education to be successful. In their response to the open-ended question in the questionnaire, the teachers also stated that the EBA class content was poor, and they lacked documents. In a previous study, the effects of the Education Informatics Network (EBA) application, which is the official digital education platform of the Ministry of Education in social studies teaching, on the achievements of the students were examined, and it was concluded that EBA should be developed as content (Yerli, 2018). EBA has been inadequate in terms of content, although some innovations have been made due to the rapid transition to the distance education process due to the COVID-19 pandemic. Similar results have been demonstrated in other studies. For example, Yilmaz (2020) stated in his study that he made suggestions for the improvement of distance education that the instructional materials in EBA are not at a sufficient level in terms of using them in distance education. Cakin and Kulekci Akyavuz (2020), in their study to determine the problems experienced by teachers in distance education, concluded that the lack of material reduces the efficiency of the classes and limits the activities to be performed. Ertan Kantos (2020) also emphasized that the content of EBA should be increased on the basis of class, as a result of the interviews with primary school teachers in order to learn their opinions about distance education. According to Bakioglu and Cevik (2020), it was stated that there were problems related to conducting the laboratory or workshop studies included in the science classes during the distance education process, and that these problems were tried to be eliminated by sending various experiment videos to eliminate these problems or by asking students to conduct individual experiments at home. These results indicate that the class contents of EBA should be improved.

According to the results obtained in this study, the rate of teachers who think that the classes taught with live classes are as efficient as the face-to-face education (6.46%) and who find it more enjoyable to teach with live classes than face-to-face education is quite low (8.18%). Similarly, in their responses to the open-ended questionnaire, it was observed that the teachers had the opinion that distance education was not as effective and efficient as face-to-face education. Teachers who are used to face-to-face education have faced a number of difficulties in the distance education process they have gone through with the COVID-19 pandemic.

Internet connection problems, insufficient ability to use technology, teachers' lack of control over the class and student, their inability to communicate with the student properly, student reluctance, and parents' indifference were among these difficulties. In a study examining the opinions of classroom teachers about distance education, it was found that all participants preferred face-to-face education, and the hybrid education system can be used in compulsory situations (Ertan Kantos, 2020). Similarly, another study has shown that teachers working in primary education during the COVID-19 process think that distance education is not as effective as face-to-face education (Cakin & Kulekci Akyavuz, 2020).

More than half of the teachers participating in this study stated that live classes did not contribute to students' meaningful learning and that they did not find the existing distance education system educationally successful. The fact that the number of students attending live classes is low and that they find the materials on the existing platforms inadequate may be effective in their thinking. In addition, considering that education is a multi-dimensional behavioral change, educational activities in the current distance education process are mostly limited in the form of knowledge transfer. Similarly, Yilmaz (2020) stated that the current situation expressed as distance education is not distance education but a distance education or learning.

In the fourth question of the study, the opinions of the teachers about the support they received from the school administration and parents were analyzed. Most of the teachers who participated in the study stated that they received support from the school administration, and a quarter did not. Nearly half of the participants did not receive support from their institution to solve technical problems they encounter in the live class. The responses given to the open-ended questionnaire also supported these findings. Some teachers stated that the school administration did not support them and their course load, working hours and responsibilities increased during the distance education period. Compared to the situation where face-to-face education is carried out, it was seen that teachers are faced with a much more intense workload, demand and expectation due to the easy accessibility of communication technologies in the virtual environment. It is important to support teachers who make a rapid transition to the distance education process in this regard. UNESCO (2020b) emphasizes that the critical roles of teachers should be recognized and supported in order to overcome the COVID-19 pandemic more easily and in a shorter time. Since they have an active role in ensuring the continuity of teaching, teachers have to be informed and supported in these and similar situations, but without the teachers' ideas and providing them with sufficient opportunities, teachers have faced pressures on some distance education methods and technologies (Saklan & Unal, 2019). These results reveal that the administrations of schools that do not support their teachers should try to meet their teachers' needs more.

The majority of the teachers who participated in the study (74.80%) stated that they did not receive support from parents in this process. Similarly, in the responses given to the open-ended questionnaire, there were teachers who mentioned that parents were indifferent and uninformed about distance education. In this process, it was determined in other studies that parents were indifferent and did not keep an eye on the students while they were on the computer (Basaran et al., 2020; Bayburtlu, 2020). However, the fact that parents are indifferent and not mediating in communication with the teacher negatively affects the relationship of the students with the school (Cakin & Kulekci Akyavuz, 2020). Therefore, parent-teacher relationship is very important for an effective learning process (Calik, 2007). The parent-teacher relationship should be handled with importance in the distance education process as in all processes of the school (Murray, 2009). Therefore, parents not having enough support can be an important factor in not getting enough efficiency in distance education.

In the last question of the study, the effects of distance education on teachers were discussed. The majority of the teachers (80.21%) stated that less than the class size of the students attending the live lesson negatively affected their motivation as a teacher. Teachers who are used to face-to-face education with their students can be expected to be negatively affected by the low participation of their students in live classes. In their study, Bakioglu and Cevik (2020) revealed that their students might lack knowledge, feel inadequate in the distance education process, and teachers are anxious during this process because they cannot communicate with the student. Some of the teachers participating in the research find the interaction with the computer annoying. Long course hours and increased workloads may have caused this situation. In addition, teachers' lack of computer interactions and difficulties in overcoming technical problems may have led to this situation. As a matter of fact, the problems of teachers about using technology in the distance education process are an important issue, because teachers who need to have basic computer knowledge in order to use digital teaching materials have various problems. Even a process that can be handled in a very short time when sufficient information is not available takes teachers' hours and thus causes a waste of time (Saklan & Unal, 2019). When the findings of the economic impact of distance education on teachers were examined, some of the teachers who had live classes stated that their burden increased economically. In this process, the need for computers, the need to expand their internet quotas, and the efforts of those living in disadvantaged areas to access internet connection can have economic effects on teachers.

It was determined that the transition to distance education has positive effects as well as negative effects on teachers. Most of the participants (69.39%) think that their experiences in distance education during the pandemic process increase their efficiency in education. Similarly, in their responses to the open-ended item, the teachers mentioned that one of the positive reflections of this process was that their experiences about distance education increased. In addition, they stated that there are positive aspects of distance education, such as keeping students in the education process and distance education being used as support when returning to normal education. During the pandemic period, teachers had to make a very rapid transition to distance education and tried to adapt to the situation in a short time. However, it is an important finding that most of the teachers stated that their experiences in this process increased their efficiency in teaching. The fact that teachers and students, who are a one-to-one interaction in the classroom environment, start teaching lessons in virtual classrooms has made it compulsory for teachers to use various technologies. This obligation may have led teachers to use educational technologies more effectively. In order to make teaching effective and to increase the quality of education, it became necessary to use various teaching materials such as videos and slides more actively, and therefore teachers had to be prepared more comprehensively in terms of content. These situations may have affected teachers' productivity positively. Similarly, Bakioglu and Cekik (2020) found that the pandemic process had positive effects on teachers in terms of using educational technologies and professional development. In this process, some resources have been created to guide teachers. For example, UNESCO (2020b) has prepared a guide on technologies for teachers to use during the pandemic. MONE has also created various informative videos for teachers, students and parents during the distance education process (Ministry of Education, 2020b). Resources like these may have helped teachers improve themselves during the pandemic process.

## Suggestions and Limitations

In line with the results obtained in the study, the following suggestions can be made for using the distance education system more effectively:

In order to achieve the desired efficiency in the distance education system where information technology is used, first of all, internet infrastructure problems should be solved and fast and cheap internet access should be provided,

In order to increase the participation rate of students in live lessons and to ensure equality of opportunity in education, the Ministry of Education should identify the students in need and provide them with the necessary equipment (device supply, internet connection) for distance education,

Face-to-face education should be used in settlements where internet infrastructure is insufficient and the number of students is low, and where distance education cannot be performed (this should also apply to students with special education needs) by taking necessary precautions in terms of health,

The infrastructure of EBA, which is the official digital education platform of the MONE, should be empowered to make it suitable for the simultaneous use of all students, the EBA course contents should be enriched in a way to include each course and the acquisition evaluation tests should be increased,

In order to get the desired level of efficiency from the distance education process, all teachers should be provided with in-service training on distance education. In-service training can introduce teachers with technologies used in distance education and enable teachers' practice these technologies in order to increase teachers' familiarity and efficient use of these technologies and improve their knowledge and pedagogical skills in distance education. This training should be repeated at certain intervals considering the change in information technologies, teachers' needs and their working conditions,

Students and parents should be educated about the platforms that can be used in live classes in distance education, and parents should be informed about how they can better support their children in this process,

The necessary equipment (camera, sound system, computer, etc.) should be provided for distance education to each teacher by the MONE or economic support should be provided for this,

A team in each school should be established to solve technical problems that may be experienced in live lessons, working in cooperation with teachers and parents should work in cooperation with the team and quickly eliminate the problems experienced,

Teachers should use their experiences about distance education during the pandemic period together with face-to-face education (they should provide distance education to students who cannot attend school for a long time or who have low achievement due to illness, family problems, etc.),

To increase the number of students attending live classes; obligatory attendance, providing parent support, enriching the course contents, increasing the interaction of students with each other and using teaching techniques suitable for distance education may be beneficial.

This study has some limitations that need to be addressed. Firstly, the sample of the study consisted of 758 teachers who were actively involved in distance education in spring semester of the 2019-2020 academic year in Turkey during the COVID-19 pandemic. Therefore, findings of this study provides empirical evidence from Turkish context. In future studies, cross-cultural studies in which teachers' opinions about and self-efficacy beliefs towards distance education can be compared and differences among countries can be examined, if any. Another limitation of the study is related to the data collection process. The data of the study relies solely on teachers' self-report responses to the online questionnaire which included mostly closed-ended items and one open-ended question. In future studies, in addition to the questionnaire, interviews can be conducted with teachers which may provide in-depth information about their experiences in distance education.

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## REFERENCES

Allinder, R. M. (1995). An examination of the relationship between teacher efficacy and curriculum based measurement and student achievement. *Remedial & Special Education*, *27*, 141-152.

Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies, 1*, 1-20.

Anadolu University (2021). Acikogretim sistemi [Open education system]. Retrieved from https://www.anadolu.edu.tr/acikogretim/acikogretim-sistemi/tarihce

Arbaugh, J. B. (2000). Virtual classroom characteristics and student satisfaction with internet based MBA couses. *Journal of Management Education*, *24*, 32-54.

Armstrong-Coppins, D. R. (2003*).* What principals do to increase collective teacher efficacy in urban schools. (Unpublished doctoral dissertation). Cardinal Stritch University College of Education. Available from ProQuest Dissertations and Thesis database. (UMI No: 3119769).

Ashton, P. (1984). Teacher efficacy: A motivational paradigm for effective teacher education. *Journal of Teacher Education 35*(5), 28-32.

Aydin, M. (2017). Uzaktan ogretici yeterliliklerinin ve yeterlilik boyutlarinin belirlenmesi [Determination of distance instructors competencies and competency dimensions]. (Master's dissertation). Karadeniz Technical University Graduate School of Educational Sciences, Trabzon, Turkey. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 472008.

Baired, K. (2020). *Caring for educators is the first step in serving students*. Retrieved from https://thejournal.com/articles/2020/05/19/caring-for-educators-is-the-first-step-in-serving-students.aspx

Bakioglu, B., & Cevik, M. (2020). COVID-19 pandemisi surecinde fen bilimleri ogretmenlerinin uzaktan egitime iliskin gorusleri [Science teachers' views on distance education in the COVID-19 pandemic process]. *Turkish Studies, 15*(4), 109-129.

Bandura. A. (1986*). Social foundations of thought and action: A social cognitive theory*. New Jersey: Prentice Hali.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W. H. Freeman and Company.

Bandura, A. (1999). Social cognitive theory: An agentic perspective. *Asian Journal of Social Psychology, 2*(1), 21-41.

Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. *Pedagogical Research, 5*(4), em0060. https://doi.org/10.29333/pr/7937

Basaran, M., Dogan, E., Karaoglu, E., & Sahin, E. (2020) Koronavirus (COVID-19) pandemi surecinin getirisi olan uzaktan egitimin etkililigi uzerine bir calisma [A study on effectiveness of distance education, as a return of coronavirus (COVID-19) pandemic process]. *Academia Egitim Arastirmalari Dergisi*, *5*(2), 179-209.

Bayburtlu, Y. S. (2020). Covid-19 pandemi donemi uzaktan egitim surecinde ogretmen goruslerine gore Turkce egitimi [Turkish education during covid-19 pandemic distance education process]. *Electronic Turkish Studies*, *15*(4), 131-151.

Bicer, H. (2019). E- ogrenmeye yonelik tutum: Olcek uyarlama calismasi [Attitudes towards e-learning: Scale adaptation]. (Master's dissertation). Necmettin Erbakan University Graduate School of Educational Sciences, Konya, Turkey. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 557168.

Blonder, R., Jonatan, M., Bar-Dov, Z., Benny, N., Rap, S., & Sakhnini, S. (2013). Can You Tube it? Providing chemistry teachers with technological tools and enhancing their self-efficacy beliefs. *Chemistry Education Research and Practice,* 14(3), 269-285.

Caprara, G. V., Barbaranelli, C., Steca, P. & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of School Psychology, 44*(6), 473-490.

Compeau D. R., & Higgins C. A., (1995), Computer self-efficacy: Development of a measure and initial test, *MIS Quarterly, 19*(2), 189-211.

Creswell, J. W. (2011). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th Ed.). London: Pearson.

Cakin, M., & Kulekci Akyavuz, E. (2020). Covid-19 sureci ve egitime yansimasi: ogretmen goruslerinin incelenmesi. *International Journal of Social Sciences and Education Research, 6*(2), 165-186.

Cakiroglu, E., & Isiksal, M. (2009). Preservice elementary teachers' attitudes and self-efficacy beliefs toward mathematics. *Education and Science*, *34*(151), 132-139.

Calik, C. (2007). Okul cevre iliskisinin okul gelistirmedeki rolu: kavramsal bir cozumleme [The role of school-environment relation in school improvement: A conceptual analysis]. *Gazi Universitesi Gazi Egitim Fakultesi Dergisi, 27*(3), 123-140.

Cukadar, S., & Celik, S. (2003). Internete dayali uzaktan ogretim ve universite kutuphaneleri [Web-based distance learning and university libraries]. *Dogus Universitesi Dergisi, 4*(1), 31-42.

De Witt, P. (2020) *6 Reasons Students aren't Showing Up for Virtual Learning*. Retrieved from http://blogs.edweek.org/edweek/finding_common_ground/2020/04/6_reasons_students_arent_showing_up_for_virtual_learning.html?intc=main-mpsmvs

Digital Transformation Office (2021). Koronavirus COVID-19 dunya haritasi [Coronavirus COVID -19 world map]. Retrieved from https://corona.cbddo.gov.tr/

Ertan Kantos, Z. (2020). Sinif ogretmenlerinin uzaktan egitim ile ilgili dusunceleri. K. Ciftyildiz, *8. Uluslararasi Bilimsel Arastirmalar Kongresi Bildiri Tam Metin Kitabi* icinde (ss. 65-81). Corum: Asos Yayinevi.

Fagell, P. L. (2020). Career Confidential: Teacher wonders how to help students during coronavirus shutdown. *Phi Delta Kappan*, *101*, 67-68.

Galusha, J. M. (1998). *Barriers to learning distance education*. Universty of Southern Missisipi.

Gibson. S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology, 76*(4). 569-582.

Hens, N., Ayele, G. M., Goeyvaerts, N., Aerts, M., Mossong, J., Edmunds, J. W., & Beutels, P. (2009). Estimating the impact of school closure on social mixing behaviour and the transmission of close contact infections in eight European countries. *BMC Infectious Diseases, 9*(187), 1-12.

Holmberg, B. (1995). *Theory and practice of distance education*. New York: Routhledge.

Isik, I., Isik, A. H., & Guler, I. (2008). Uzaktan egitimde uc boyutlu web teknolojilerinin kullanilmasi [Using the 3D web technologies in distance education]. *Bilisim Teknolojileri Dergisi*, *1*(2), 75-78.

Iwai, Y. (2020). *Online Learning during the COVID-19 Pandemic: What do we gain and what do we lose when classrooms go virtual?', Scientific American*. https://blogs.scientificamerican.com/observations/online-learning-during-the-COVID-19-pandemic/

Joreskog, K., & Sorbom, D. (2007). *LISREL 8 User's Guide*. Chicago: Scientific Software.

Kaden, U. (2020). COVID-19 school closure-related changes to the professional life of a K–12 teacher. *Education Sciences*, *10*(165), 1-13.

Kaya, Z. (2002). *Uzaktan egitim* [Distance education]. Ankara: Pegem A Yayinlari.

Kirik, A. M. (2014). Uzaktan egitimin tarihsel gelisimi ve Turkiye'deki durumu [Historical development of distance education and the situation in Turkey]. *Marmara Iletisim Dergisi, 21*, 73-94.

Košir, K., Dugonik, Š., Huskić, A., Gračner, J., Kokol, Z., & Krajnc, Ž. (2020). Predictors of perceived teachers' and school counsellors' work stress in the transition period of online education in schools during the COVID-19 pandemic. Retrieved from https://psyarxiv.com/gj3e5/

Larrick, C. S. (2004). *Collective teacher efficacy and student achievement. (*Unpublished doctoral thesis). Universty of Virginia. Available from ProQuest Dissertations and Thesis database. (UMI No: 3144628).

Lee M. H., & Tsai C. C., (2010), Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the World Wide Web, *Instructional Science, 38*, 1-21.

Ministry of Education (2020a). Retrieved from http://www.meb.gov.tr/

Ministry of Education (2020b). Retrieved from http://uzaktanegitim.meb.gov.tr/www/bilgilendirme-videolari/kategori/12

Murray, C. (2009). Parent and teacher relationships as predictors of school engagement and functioning among low-income urban youth. *The Journal of Early Adolescence, 29*(3), 376-404.

Pirtle, W. N. L. (2020). Racial capitalism: A fundamental cause of novel coronavirus (COVID-19) pandemic inequities in the United States. *Health Education & Behavior, 47*(4), 504–508.

Merrill, S. (2020). *Teaching through a Pandemic: A Mindset for This Moment*. Retrieved from https://www.edutopia.org/article/teaching-through-pandemic-mindset-moment

Midgley, C., Feldlaufer. H., & Eccles, J. S. (1989). Change in teacher efficacy and student self- and task related beliefs in mathematics during the transition to junior high school. *Journal of Educational Pschology, 81*(2), 247-258.

Ozbay, O. (2015). Dunyada ve Turkiye'de uzaktan egitimin guncel durumu [The current status of distance education in the world and Turkey]. *Uluslararasi Egitim Bilimleri Dergisi 2*(5), 376-394.

Ozer, B. (1999). Uzaktan egitim sisteminin evrensel yapisi [Universal structure of the distance education system]. *Kurgu Dergisi*, *8*, 569-594.

Ross, J. A. (1994). The impact of an inservice to promote cooperative learning on the stability of teacher efficacy. *Teaching and Teacher Rducation, 10*(4), 381-394.

Sahu, P. (2020). Closure of universities due to coronavirus disease 2019 (COVID-19): Impact on education and mental health of students and academic staff. *Cureus*, *12*(4). doi: 10.7759/cureus.7541

Saklan, H., & Unal C. (2019). Dijital egitim platformlari arasinda EBA'nin yeri ile ilgili Fen Bilimleri ogretmenlerinin gorusleri [Opinions of science teachers on the status of EBA among digital education platforms]. *Ondokuz Mayis Universitesi Egitim Fakultesi Dergisi, 38*(1), 19-34.

Schneider, S. L., & Council, M. L. (2020). Distance learning in the era of COVID-19. *Archives of Dermatological Research*, *1*. https://doi.org/10.1007/s00403-020-02088-9

Talidong, K. J. B., & Toquero, C. M. D. (2020). Philippine teachers' practices to deal with anxiety amid COVID-19. *Journal of Loss and Trauma*, *25*(6-7), 573-579.

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17*(7), 783-805.

Tschannen-Moran, M., & Woolfolk-Hoy, A. (2007). The differential antecedents of self-efficacy of novice and experienced teachers. *Teaching and Teacher Education, 23*, 944–956.

Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68*(2), 202-248.

Tuckman, B. W., & Sexton, T. L. (1990). The relation between self-beliefs and self-regulated performance. *Journal of Social Behavior and Personality*, *5*(5), 465-472.

UNESCO (2020a). *SDG-Education 2030 Steering Committee Urges Protection of Education, now and post-crisis*. Retrieved from https://sdg4education2030.org/sdg-education-2030-steering-committee-urges-protection-education-now-and-post-crisis

United Nations Educational, Scientific and Cultural Organization [UNESCO] (2020b). *How to keep Engaged Remotely with Your Students in the Context of the COVID-19 Crisis: TipforTeachers.* https://en.unesco.org/news/resources-parents-and-teachers-motivating-supportingchildren-during-remote-learning.

Ustun, A. B., Karaoglan Yilmaz, F. G., & Yilmaz, R. (2020). Ogretmenler e-ogrenmeye hazir mi? Ogretmenlerin e-ogrenmeye yonelik hazir bulunusluklarinin incelenmesi uzerine bir arastirma [Are teachers ready for e-learning? A study on exploring e-learning readiness of teachers]. *Ahmet Kelesoglu Egitim Fakultesi Dergisi*, *2*(1), 54-69.

Van Lancker, W., & Parolin, Z. (2020). COVID-19, school closures, and child poverty: A social crisis in the making. *The Lancet Public Health*, *5*, e243-e244.

Varol, A. (2001). YOK Enformatik Milli Komitesinin gorevleri ve Turkiye'de uzaktan egitim. *Sakarya Universitesi Egitim Fakultesi Dergisi, 3*, 41-53. Retrieved from https://dergipark.org.tr/en/download/article-file/115823

Viner, R. M., Russell, S. J., Croker, H., Packer, J., Ward, J., Stansfield, C., … & Booy, R. (2020). School closure and management practices during coronavirus outbreaks including COVID-19: A rapid systematic review. *The Lancet Child & Adolescent Health, 4*(5), 397-404.

Wang, C., Cheng, Z., Yue, X.-G., & McAleer, M. (2020). Risk Management of COVID-19 by universities in China. *Journal of Risk and Financial Management, 13*(36), 1-6.

Winter, L. (2020). *I'm a teacher in Italian quarantine, and e-learning is no substitute for the real thing.* Retrieved from https://www.theguardian.com/commentisfree/2020/mar/18/italy-quarantine-e-learning-coronavirus-schools-lockdown-teaching-children

Woolfolk, A. E., Rosoff, B., & Hoy, W. K. (1990). Teachers' sense of efficacy and their beliefs about managing students. *Teaching and Teacher Education, 6*(2), 137-148.

Telli Yamamoto, G. T., & Altun, D. (2020). Coronavirus ve cevrimici (online) egitimin onlenemeyen yukselisi [The coronavirus and the rising of online education]. Universite Arastirmalar Dergisi, *3*(1), 25-34.

Yang, X. (2020). Teachers' Perceptions of Large-Scale Online Teaching as an Epidemic Prevention and Control Strategy in China. ECNU *Review of Education,* 1-6. doi: 10.1177/2096531120922244

Yerli, M. S. (2018). Sosyal bilgiler ogretiminde Egitim Bilisim Agi (EBA) uygulamasinin ogrencilerin akademik basarisina etkisi [Education Information Network (EBA) of the application of social studies in teaching students academic success of the effect of]. Master's dissertation). Adiyaman University Graduate School of Educational Sciences, Adiyaman, Turkey. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 508960.

Yildiz, M. (2015). Uzaktan egitim programlarinda ders veren ogretim elemanlarinin uzaktan egitime yonelik bilgi, inanc ve uygulamalari arasindaki iliskiler [The relationships among distance education instructors' knowledge, belief and practices towards distance education]. (Master's dissertation). Hacettepe University Graduate School of Educational Sciences, Ankara, Turkey. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 394811.

Yilmaz, M. (2020). *Uzaktan egitimin iyilestirilmesi: Salgin kaynakli egitim krizini asmak icin oneriler* [Improving distance education: recommendations for overcoming the epidemic education crisis]. Istanbul: ILKE Ilim Kultur Egitim Vakfi.

## APPENDIX

## Questions in the Third Part of the Questionnaire

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| 1. Sinifinizdaki ogrencilerin yuzde kaci canli derse (sanal sinif/cevrimici ders) katiliyor?<br>[What percentage of students in your class attend the live class (virtual classroom/online class)?]<br>☐ %1-%25 ☐ %26-%50 ☐ %51-%75 ☐ %76-%100 |
| (Canli derse katilan ogrenci sayisinin az oldugunu dusunuyorsaniz 2. soru ile devam ediniz, dusunmuyorsaniz 3. soruya geciniz.)<br>[(If you think the number of students attending the live class is insufficient, continue with question 2, if not, continue with question 3.)]<br>2. Canli derslere katilan ogrenci sayisinin sinif mevcudundan az olmasi ogretmen olarak motivasyonunuzu olumsuz etkiliyor mu?<br>[Does the fact that the number of students attending live classes is less than the class size negatively affect your motivation as a teacher?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 3. Size gore canli ders icin en uygun saat dilimi hangisidir?<br>[In your opinion, what is the best time for live classes?]<br>☐ 07-09 ☐ 09-11 ☐ 11-13 ☐ 13-15<br>☐ 15-17 ☐ 17-19 ☐ 19-21 ☐ 21-23 |
| 4. Canli derste karsilastiginiz teknik problemleri cozmek icin kurumunuzdan herhangi bir destek aliyor musunuz?<br>[Do you get any support from your institution to solve the technical problems you encounter in the live classes?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 5. Canli ders sayesinde her durumda rahatca sinif ortami olusturup ders isleyebileceginizi dusunuyor musunuz?<br>[Do you think that you can easily create a classroom environment and teach through the live classes?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 6. Uzaktan egitimde olcme ve degerlendirmeyi etkili olarak gerceklestirebiliyor musunuz?<br>[Can you effectively perform assessment and evaluation in distance education?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 7. Size gore ders konulariniz, canli ders ile islenmeye uygun mu?<br>[In your opinion, are your class subjects suitable to be taught with live classes?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 8. Uzaktan egitim alan ogrencilerin basarili olabilmeleri icin platformdaki mevcut ders materyalleri ile calismalarinin yeterli oldugunu dusunuyor musunuz?<br>[Do you think that it is sufficient for distance education students to work with the current instructional materials on the platform in order to be successful?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 9. Canli derslerin ogrencilerin anlamli ogrenmesine katki sagladigini dusunuyor musunuz?<br>[Do you think that live classes contribute to students' meaningful learning?]<br>☐ Evet [Yes] ☐ Hayir [No] |

| | |
|---|---|
| 10. | Mevcut uzaktan egitim sistemini egitsel acidan basarili buluyor musunuz?<br>[Do you find the current distance education system to be educationally successful?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 11. | Uzaktan egitim size ekonomik bir yuk getirdi mi?<br>[Has distance education placed an economic burden on you?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 12. | Bilgisayar sistemi ile etkilesimi sinir bozucu buluyor musunuz?<br>[Do you find the interaction via the computer system annoying?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 13. | Canli derslerle isledīginiz dersin yuz yuze egitimdeki kadar verimli oldugunu dusunuyor musunuz?<br>[Do you think the lessons you teach with live classes are as efficient as in face-to-face education?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 14. | Canli ders ile ders islemeyi, yuz yuze egitimle ders islemeye gore daha zevkli buluyor musunuz?<br>[Do you find it more enjoyable to teach with live classes than with face-to-face education?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 15. | Pandemi doneminden once teknolojiyi derslerinizde aktif olarak kullaniyor muydunuz?<br>[Did you use technology actively in your classes before the pandemic period?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 16. | Pandemi surecinde uzaktan egitim konusunda edindiginiz deneyimlerin egitimdeki verimliliginizi arttirdigini dusunuyor musunuz?<br>[Do you think your experiences in distance education during the pandemic period increased your efficiency in education?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 17. | Uzaktan egitim surecinde velilerden yeterli destek gordunuz mu?<br>[Did you receive sufficient support from parents in the distance education process?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 18. | Uzaktan egitim surecinde okul yonetiminden yeterli destek gordunuz mu?<br>[Did you receive sufficient support from the school administration during the distance education process?]<br>☐ Evet [Yes] ☐ Hayir [No] |
| 19. | Uzaktan egitim deneyimleriniz ile ilgili eklemek istediginiz baska bir sey varsa lutfen yaziniz.<br>[Please write if there is anything else you want to add about your distance education experiences.] |

# VISUALIZATION OF DATA ANALYSIS FOR EVALUATION OF THE LEVEL OF IT-SPECIALISTS COMPETENCIES' CREATION

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## ABSTRACT

In the study the authors show how visualization and analysis of education data could be used in simulation and adjustment of education program curriculum for future evaluation of the formation levels the graduates competences as specified by educational standard. The authors suggest the scenario that demonstrate the possibility of automatic evaluation of graduate competences formation. This study is a viable teaching tool that can be used to simulation of the pedagogical activity scenario in order to eliminate all kinds of gaps in the training of the graduates and the evaluation of their professional competencies. The approach proposed in the study can be used to build a more result-oriented educational program by its redesigning to eliminate identified gaps in the consideration of important learning outcomes (the formation level of graduates' professional competencies) and evaluate the educational program using an updated visual model of evaluation activity. The relevance of this work is also based on its contribution to expanding the capabilities of multidimensional analysis and visualization of the results in relation to solving professional educational tasks.

**Keywords:** Visualization of data analysis, Big Data in education, information visualization and data analysis, graduate pro-fessional competencies, qualification units, qualification model of specialist, competence based content of the educational program.

## INTRODUCTION

Information technology education (IT) is an area that constantly needs to be evaluated and transformed in order to align with the quickest turnaround rate in various market areas. The main factor that fundamentally changes the training method is a technology (Ukuev, 2018). Examples of various types of technologies used in education are mobile devices, systems for teleconferences, remote access systems, learning platforms and others with which students, lecturers, and the administration of the education institution interact. These technologies are used to influence and improve teaching and training, and also show techniques for using modern technology under real-world conditions. Interaction with these technologies generates large amounts of data, which can be divided into the following groups (Utyomov and Gorev, 2018):

- personal data;
- data on the interaction of students with electronic learning systems (electronic textbooks, online courses);
- data on the effectiveness of teaching materials;
- administrative (total-system) data;
- predicted data.

Nevertheless, educational systems are not fully prepared to handle with these data, and use these systems in order to continuously improve the quality and evaluate the level of formation graduates' competences. Particularly, education in IT training for students constantly needs to consider the high volume of changing knowledge and actual data in learning activity in order to meet the needs of qualified IT specialists that are capable of solving professional tasks.

All data are stored in various structured and unstructured formats. Some data are available, while other often require more effort to its processing. Moreover, the data sources are often fragmented and not available to those who need them. Even when data are available, decision makers often do not know about it and do not have the tools or necessary skills to use the data (Cech et al, 2018; Custer et al, 2018). At the same time if both teacher's knowledge and available data are used, students can get better results in the process of education (Blazar, Kraft, 2017).

Two analytical methods (educational data mining and training analytics) that can upgrade training systems and success level of educator/educational institution are used to improve the quality of educational services and various key performance indicators (Adejo and Connolly, 2017; Liñan and Pérez, 2015). In cases where data mining tends to focus on developing new tools for discovering patterns in data, training analytics focuses on applying tools and techniques at larger scales (Oyerinde et al, 2015).

Big data in higher education could allow developing an understanding of "student achievement and training approaches" and having positive influence on key areas such as actual student achievement in accordance with the curriculum (Vaitsis et al, 2016). Big data and analytics in higher education have recently been seen as holding great potential to promote actions concerning 'administrative decision-making and organizational resource allocation', early identification of at-risk students and interventions to prevent them from failing, the development of more effective instructional techniques, and transforming the traditional view of the curriculum into a network of relations, using educational data collected regularly from learning management systems, social networks, learning activities, and the curriculum itself (Masino and Niño-Zarazúa, 2016; Braganza et al, 2017). The curriculum, its content and the learning outcomes are part of the educational data on the basis of which analytics can be used to study quality and higher education improvement and the level of graduates competence evaluation (Agasisti and Bowers, 2017; Kumar and Vivekanandan, 2018; Kulasegaram and Rangachari, 2018).

The emergence of big data requires new prospects for data management and analytics, including advanced methods and tools for data visualization to support learning processes. The developing research area in the field of visual analytics has the benefit of combining data analysis and data manipulation, representation of information and knowledges for the understanding and recognition of visual patterns.

The purpose of the study is to show effectiveness of the software tools of the visualization of educational data analysis for adjustment of education program that is aimed at competencies' creation of students.

## JUSTIFICATION AND PROBLEM STATEMENT OF THE RESEARCH

Large amounts of educational data are captured and generated on a daily basis from different sources and in different formats in the higher educational ecosystem (Vaitsis et al, 2016; Murumba and Micheni, 2017). Educational data vary from data obtained from the use and interaction of students with Learning Management Systems (LMS) and platforms, to learning events and course information, including the curriculum, learning materials, exam results and other types of data related to administrative, educational and qualitative processes and procedures. In addition, continuously updated technologies and approaches in IT, which should be reflected in educational activities, develop a lot of data, and its nature is not static and is like a snapshot (Davari et al, 2019) of a long-term volatile network at the time of its aquisition.

In modern conditions, the development of information technologies requires graduate to comply with a high level of professional readiness. The advent of professional standards gives to the employer the opportunity to fix the requirements for graduates' knowledge and skills that define the specialist (Rehman, 2014). Requirements exist for theoretical knowledges and for practical skills of applicants. On the other hand, educational institutions develop required competencies for students through the Federal State Educational Standard, curriculums, and education plans. The result of joint activity of potential employers in the educational process is a specialist, an active person who is able to define and achieve the aim of one's professional activity.

Table 1 presents the average results of expert assessments obtained from 100 respondents that assessed the level of the impact of modern areas of information technology development on a 10-point scale, where 1 is a little impact and 10 is the strong impact. An expert assessment of the potential impact of the IT development on the formation of educational programs in the field of information technology was calculated on the basis of these indicators (Figure 1).

**Table 1.** Experts assessment results of modern IT influence on IT educational programs and students' competencies

| IT research fields | | IT degree | Competencies | Knowledge | Efficiencies | Skills |
|---|---|---|---|---|---|---|
| Artificial intelligence | d1 | 3,5 | 0,35 | 1,2 | 0,6 | 1,8 |
| Bioinformatics | d2 | 2,45 | 0,65 | 1,05 | 0,3 | 0,4 |
| Computational science | d3 | 1,65 | 0,85 | 0,15 | 0,2 | 0,4 |
| Computer science | d4 | 2,45 | 0,445 | 0,9 | 0,3 | 0,4 |
| Database engineering | d5 | 3,5 | 0,3 | 1,35 | 0,8 | 1,6 |
| Graphics | d6 | 2,8 | 0,7 | 0,15 | 0,8 | 1,6 |
| Human-computer interaction | d7 | 1,35 | 0,8 | 0,15 | 0,2 | 0,2 |
| Information science | d8 | 2,75 | 0,6 | 0,15 | 0,8 | 1,8 |
| Knowledge engineering | d9 | 3,25 | 0,35 | 1,2 | 0,8 | 1,8 |
| Multimedia design | d10 | 2,45 | 0,65 | 1,35 | 0,6 | 1,6 |
| Network engineering | d11 | 2,75 | 0,45 | 1,5 | 0,3 | 0,4 |
| Performance analysis | d12 | 2,45 | 0,55 | 1,5 | 0,6 | 0,8 |
| Software architecture | d13 | 1,4 | 0,85 | 0,15 | 0,2 | 0,4 |
| Software engineering | d14 | 1,35 | 0,445 | 0,9 | 0,3 | 0,4 |
| System administration | d15 | 1,55 | 0,3 | 1,35 | 0,8 | 1,6 |
| System security and privacy | d16 | 3,15 | 0,7 | 0,15 | 0,8 | 1,6 |
| Web service design | d17 | 2,45 | 0,8 | 0,15 | 0,2 | 0,2 |
| Robotics and robot software | d18 | 3,5 | 0,6 | 0,15 | 0,8 | 1,8 |
| AR and VR | d19 | 2,8 | 0,35 | 1,2 | 0,8 | 1,8 |
| Cloud technologies | d20 | 1,35 | 0,65 | 1,35 | 0,6 | 1,6 |
| Smart cities | d21 | 2,75 | 0,45 | 1,5 | 0,3 | 0,4 |
| Data science | d22 | 3,25 | 0,55 | 1,5 | 0,6 | 0,8 |
| Internet of things | d23 | 2,45 | 0,85 | 1,35 | 0,7 | 1,2 |
| Big data | d24 | 2,75 | 0,35 | 1,8 | 0,5 | 1,4 |

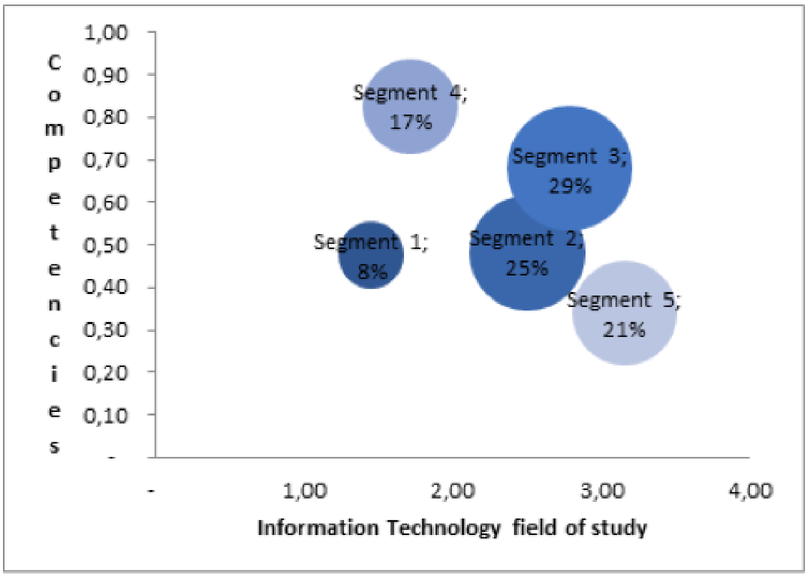


**Figure 1.** Influence cluster of modern IT on IT educational programs and students competencies formation

Figure 2. shows the dependence diagram of IT specialization, professional competencies and modern lines of IT research.

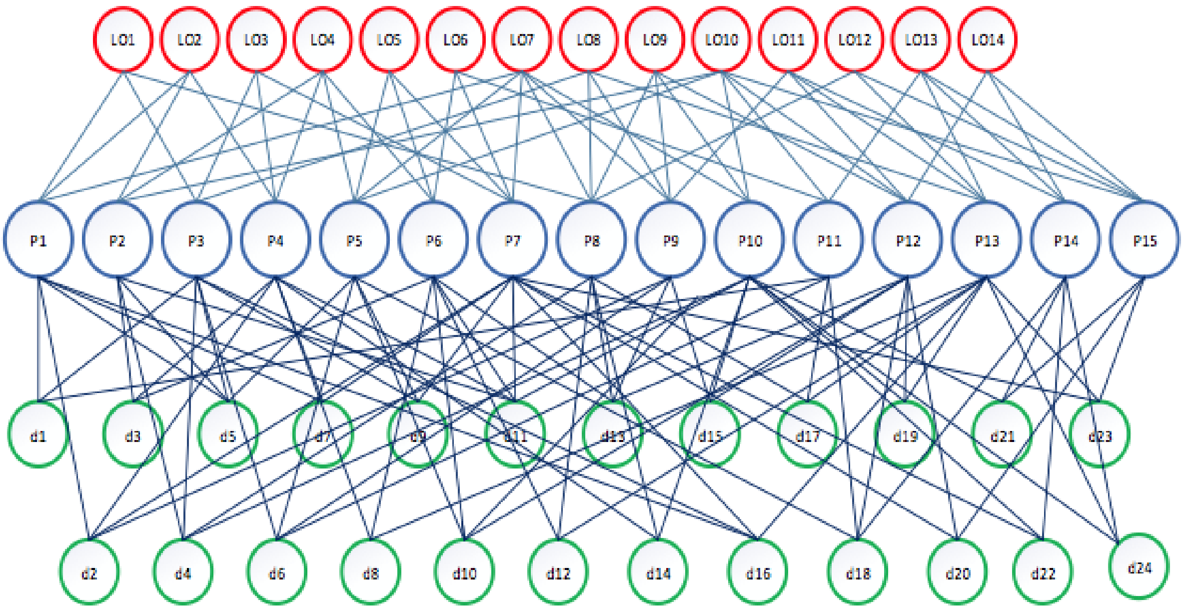


**Figure 2.** Dependence diagram of IT specialization, competencies and IT sphere

Tables 2-3 show key measures presented in Figure 2.

**Table 2.** IT specialization

| *IT specialization* | |
|---|---|
| Software programmer | P1 |
| Software architect | P2 |
| Test leader | P3 |
| Database manager | P4 |
| Software product manager | P5 |
| Information Resources Specialist | P6 |
| Information Technology Manager | P7 |
| IT system technician | P8 |
| Technology leader | P9 |
| Product owner | P10 |
| Systems analyst | P11 |
| Information technology systems administrator | P12 |
| System programmer | P13 |
| Software/Web developer | P14 |
| Systems integration specialist | P15 |

**Table 3.** Description of results of education for IT educational programs

| Professional competencies | |
|---|---|
| The ability to collect, process, and interpret data of modern scientific studies necessary to form conclusions on the scientific studies | LO1 |
| The ability to understand, upgrade and use of modern mathematical tool | LO2 |
| The ability to develop and use of algorithmic and programming solutions in the area of system and applied software | LO3 |
| The ability to apply modern information technology in designing, implementing, assessing and analyzing of the software efficiency for solving problems in different subject areas | LO4 |
| The ability to use basic techniques and design automation facilities, implementation, investigation and quality assessment when creating a competitive software product and software systems, and methods and tools of automating associated with the maintenance, administration and modernization of software products and software systems | LO5 |
| The ability to use the knowledge of computers trend with traditional (non-traditional) software design; modern system software; operating systems, operating and network shells, service programs; development trends of functions and design of problem-oriented software systems and complexes in professional activities | LO6 |
| The ability to use the conceptual settings of the functional, logical, object-oriented and visual programming areas, methods, techniques and development tools of programs within these areas | LO7 |
| The ability to use modern development methods and implementation of specific algorithms of mathematical models based on software languages and application software package of modeling | LO8 |
| The ability to make a survey of organizations, identify information needs of users, formulate requirements for the information system | LO9 |
| The ability to develop and adapt application software | LO10 |
| The ability to design IP by type of software | LO11 |
| The ability to compose a technical and economic feasibility study for design decisions and terms of reference for the design of an information system | LO12 |
| The ability to test IP software components | LO14 |
| The ability to maintain a database and support information application for solving applied problems | LO14 |

Significant estimates can be drawn on the basis of the presented visualization, for example, which ability is most affected by the educational program (specialty of IT training) and/or by the field of professional research (main trends in IT). You can also demonstrate the clusters of the educational program used to solve professional problems in the field of modern IT areas, and more.

Thus, large educational data is simulated by information visualization and data analysis (VA) methods and presented in visual interfaces with which human visual perception interacts to influence the process of analytical thinking (Khan and Khan, 2011; Cashman et al, 2018; Keim et al , 2008; Choi et al, 2019).

VA has the potential to support the process of manipulating and using big data by creating a whole picture of the data, uncovering the basic complex information to the greatest extent possible in order to have a positive impact on analytical thinking and decision making.

The most characteristic of the information visualization tasks and analysis of educational data are the following (Gorlushkina et al, 2015):

- monitoring and evaluation of the professional competencies formation;
- curriculum and course development;
- analysis and forecasting of students competitive ability in the labor market;
- diagnosis of the educational program quality level;
- assessment of the education quality for its compliance with standards.

The general objective of the study is to research new ways of analyzing and presenting the curriculum data of the educational program and the results of its development, aimed at assessing the level of graduates' professional competencies formation, using methods of visualization of data analysis (VA).

Specific objectives are: (1) signification of the various aspects affected to how the training is conducted by understanding the collected educational data from the educational program to determine and correctly apply the methods for analyzing and identifying important aspects in them; usage of VA for further analysis and visualization of the identified aspects and determining the value of VA methods applied to the curriculum data of the educational program; (2) construction of a mathematical model of graduate professional competencies evaluation to develop a visual evaluation method of the level of graduates' professional competencies formation for the implementation of the prototype automation software tools for the visualization process of information and analysis of educational data.

## APPROACHES TO THE RESEARCH PROBLEM

### Analysis of the Educational Program Curriculum Data and Its Visualization

An analysis of educational data was made to create a scientific basis and determine the scope of visualization within the curriculum (course) of the educational program. The analysis includes various learning activities (teaching methods), assessment methods (written and other types of exams), learning outcomes (LO1 – LO14) and the main results (knowledges (Z), efficiencies (U) and skills (V)).

Figure 3 illustrates how the learning outcomes (LO) and training methods (TM) of one course were simulated to visually represent a hidden network and relationship between them.

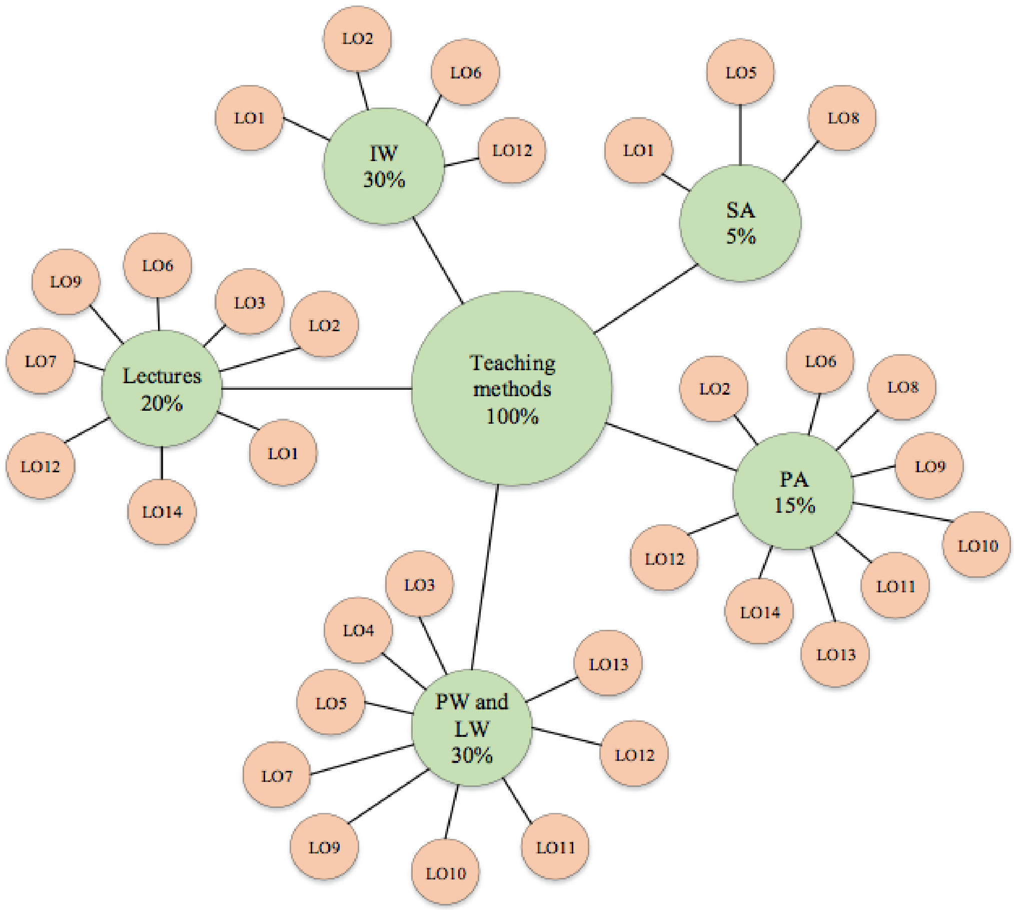


**Figure 3.** The relationship of the learning outcomes and teaching methods within the framework of the curriculum

Visualization of training methods (TM) (indicated in green) shows the use of each TM in the course. It is shown in what proportion a particular training method is involved in the IT graduate professional competencies formation for each TM. The diagram shows that the TM includes lectures, practical and laboratory work (PW and LW), self-directed learning (SL), as well as project (PA) and scientific (SA) activities. It can be said that the main contribution to the formation of the estimated results is made by practical and laboratory works, as well as self-directed learning. Project activity is an important part of pedagogical methods oriented to consolidate the material received from the learning process; it occupies 15%.

Thus, it is possible to review the structure, interconnection and correlation of learning methods with regard to the results, as well as to determine the share of participation of each training methods in their formation.

Figure 4 presents the modeling of the learning outcomes of one educational program course. The percentages in green circles represent the share of various types of final control according to the results of the educational program learning. It can be seen that the main type of the results examination is testing; an integral part of the final control for testing practical skills is the existence of term papers (TP) or course projects (CP), as well as the provision of reports on the laboratory (LW) and/or practical work (PW).

Testing results allow to assess the level of new knowledge and skills, and the fulfilment of course projects and practical works are the results of practical training. The final test is carried out in the form of computer testing and includes three main modules: the first module (M1) represents the theoretical aspect aimed at knowledge checks; the second module (M2) is the practical part that checks the level of theoretical material learning and the formation of skills; the third module (M3) is a control unit and is aimed at skills checks.

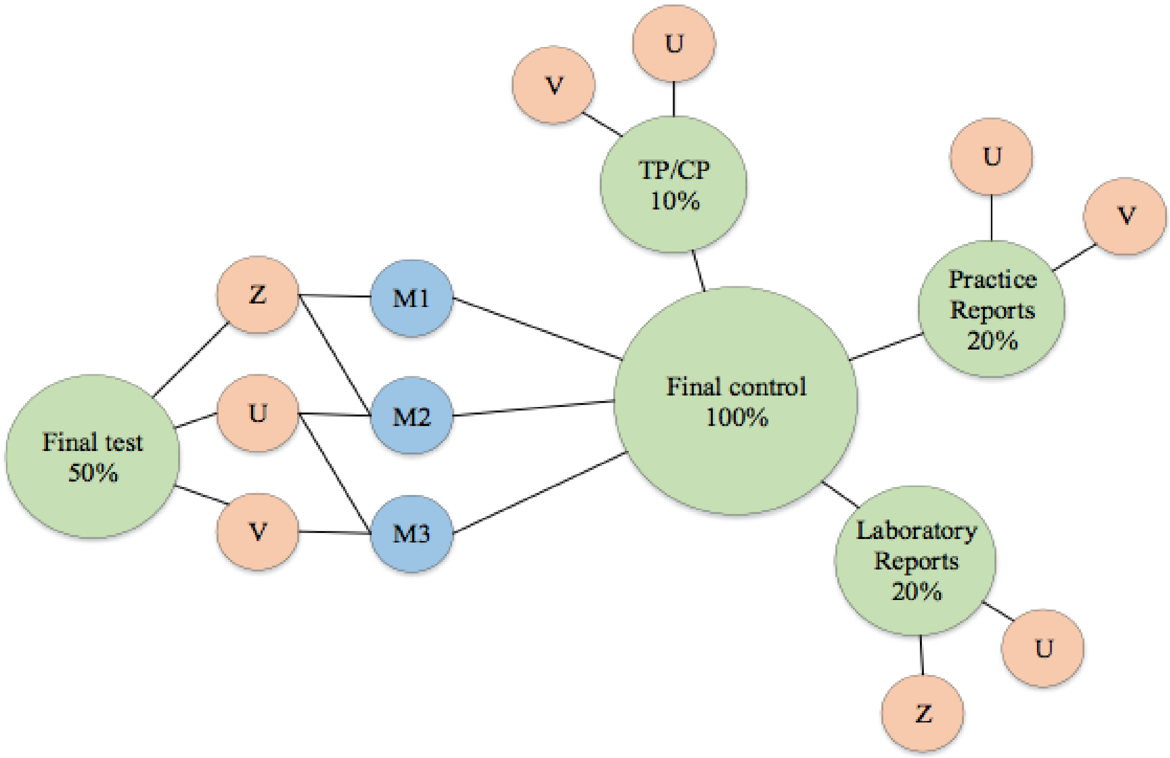


**Figure 4.** Final control and learning outcomes

This approach can be used to make a more exam-oriented educational program by redesigning it to eliminate identified gaps in the consideration of important LOs and evaluate the educational program using an updated visual model of evaluation activity.

Figure 5 shows the visualization of the entire educational program. Training methods are shown in green, LOs are shown in blue, and the main results aimed at determining the conformity of the chosen direction in the field of information technology and the educational program are shown in yellow. Split lines show how teaching methods influence on the formation of professional competencies (LO). The main results of the mastering the educational program are formed in the areas of IT research (di). The diagram shows the results of mastering the Applied Informatics curriculum, two study groups with an average of 20 people participated in the testing. The diagram (Figure 5) shows that the results of mastering the educational program and the level of students' competencies make part of the specialists in modern areas of information technology presented in Table 1. The success rate is shown in percentage, the extent of the generated results in IT areas (di) correspond to that or other IT professional qualifications (Pi).

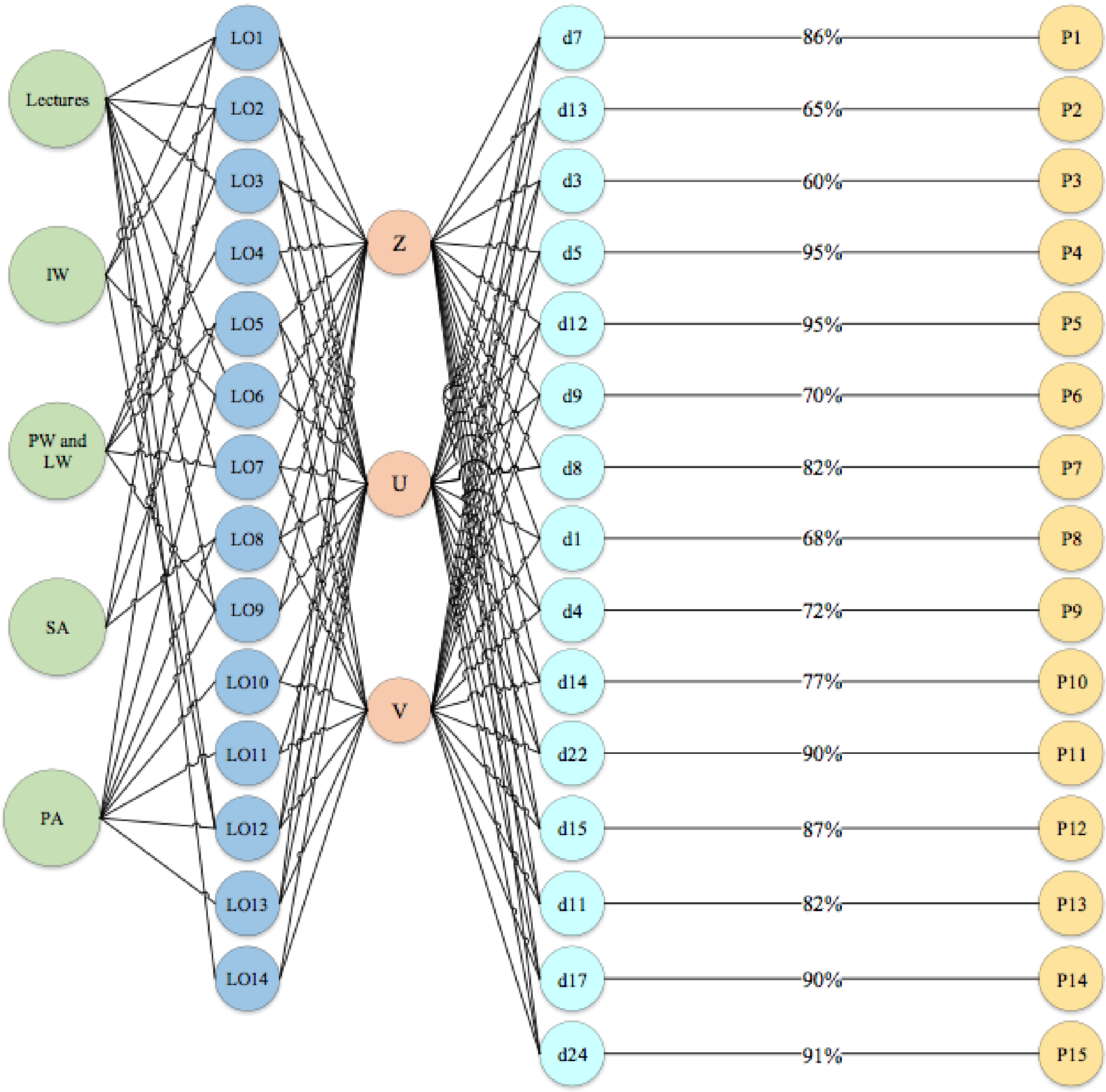


**Figure 5.** Structural alignment and educational program gap analysis

The realized visualization summarizes all the information from Figures 3 and 4, providing further more information about the educational program, so the entire educational program could be viewed as a whole and from different points of view.

In considering the model (Figure 5), it is possible to analyze educational data in different ways. One can see the relationship between the most specific and appreciated LOs, showing that the educational program aimed at knowledge, efficiencies and skills to determine the degree of their participation in the learning outcomes formation, as well as in identifying unformed learning outcomes and its gaps. The possibility that the structural alignment in the educational program can be tested as a synthesis of possible identified gaps and the use of learning events and LO in one place, presenting the educational program in the form of a structured system. The level of students' success in any of the learning outcomes can be associated not only with the importance of this learning outcome, but also with the degree to which it is taken into account in teaching methods. In this case, any gaps in the taught but unappreciated learning outcomes can be quickly identified.

Thus, at the stage of curriculum development, one can use mapping tools to identify actual gaps: determining teaching goals that cannot be solved correctly in the teaching or learning process; developing recommendations for determining new and motivating learning events to obtain the required learning outcomes.

In addition, with the help of analytics tools, one can further analyse a group of students and predict their needs such as performance, various conceptions of learning, technologies and group behavior. Several algorithms and prediction models that can develop the characteristics of a students' group and determine the degree of their professional competencies formation process data of this type. Visualization tools can be used to give alternative suggestions for developing proper types of activities for a particular group, as well as illustrate the effects of each option. In addition, visualization can clearly demonstrate the results of the knowledge formation, efficiencies and skills of students generated by training under the educational program, as well as show their level of competencies formation.

## Analysis of Educational Data in The Construction of A Mathematical Model of Student Professional Competence Evaluation

The main information providers for the formation of graduates' competencies requirements are employers, employees and analysis of the workers functional responsibilities in the area specialist is training. Information fusion allows to form the requirements that the labor market applies to the competencies of graduates.

The problem of quantitative evaluation of the level of competencies and other students' qualification profile arises when developing an educational program for IT specialist with employers (Fomina et al, 2019; Leontyev et al, 2016; Zavadský et al, 2019). This is the relevance of the task of improving the mathematical tool for measuring and evaluating qualification characteristics, building models that allow doing the analysis of dynamics in student awareness level depending on the adoption of certain managerial solutions.

The formation of qualification units QuS can be realized in the process of learning the teaching units (modules), separate discipline or group of disciplines. At the same time, some competency-based qualification units, that fill the PC competence, are formed. In the process of learning the discipline Di, students get the knowledge $Z_{Di}$, efficiencies $U_{Di}$ and skills (proficiency) $V_{Di}$. The complex of knowledge, efficiencies and skills formed during the study of the discipline influences on the final indicator of competence in the form of one or more competence-based units.

Mathematical problem statement is defined as follows: each element of the Qui set is assigned a numerical score that reflects the level of the qualification unit, then the generalized qualification model of a specialist can be described as follows:

$Qu^i=\{qu^1, qu^2, \ldots, qu^S\}$

Where

$Qu^i$ is the description of the qualification unit;

$i$ is its number in the set;

$S$ is the total number in the set.

Figure 6 shows the scheme for filling competence with qualification units in the process of studying the disciplines of the educational program.

The result of the evaluation is a qualification model of a specialist, which includes:

skill profile, as a set of qualification units;

set of numerical scores describing the level of employers requirements.

The qualification model of a specialist determines the set of professional competencies $PC = \{PC^{[i]}\}, (i = \overline{1:S})$, , which the student should get while learning. Each professional competence $PC^{[i]} = \{Z^{[i]}, U^{[i]}, V^{[i]}\}$ consists of ordered sets of "knowledge"

$Z^{[i]} = \left\langle z_1^{[i]}, \ldots, z_n^{[i]} \right\rangle$, "efficiencies" , "proficiencies" $U^{[i]} = \left\langle u_1^{[i]}, \ldots, u_m^{[i]} \right\rangle$,

$V^{[i]} = \left\langle v_1^{[i]}, \ldots, v_r^{[i]} \right\rangle$, that indicate the structure of the studied disciplines $D = \langle D_j \rangle, (j = \overline{1:T})$. .

The qualification model of a specialist can be represented as a space of sets:

{PC, Z, U, V, D, T}

Where

*PC* is a set of professional competencies;

*Z* is a set of "knowledge" elements;

*U* is a set of "efficiencies " elements;

*V* is a set of " proficiencies " elements;

*D* is a set of disciplines identified by the educational program;

*T* is the set of time response characteristic of the evaluation process.

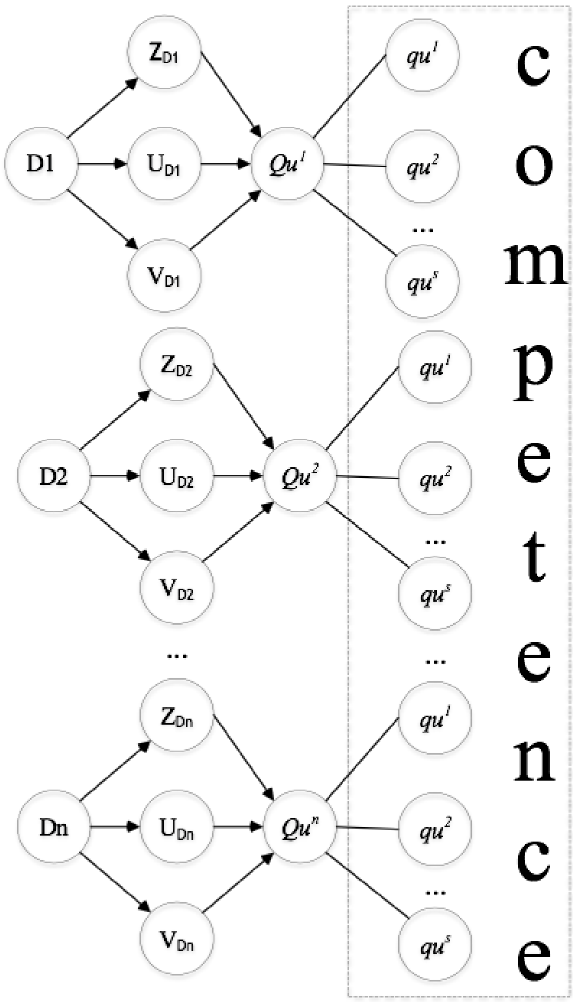


**Figure 6.** Competence Formation Scheme

An ordered set of all educational disciplines determines its competence based content. The proposed model (Figure 7) makes it possible to present the structure of the process of professional competencies and discipline formation in the education system through the interconnection of their components: "knowledge – efficiencies – proficiencies" (Gitman, 2014).

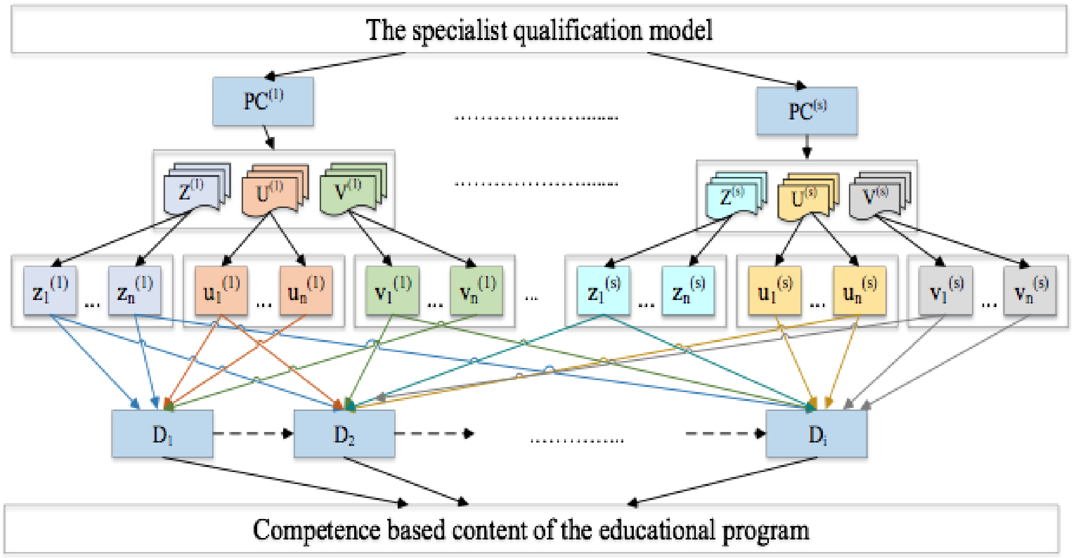


**Figure 7.** Competence based content of the educational program for the implementation of the specialist qualification model

An analysis of existing approaches to professional competencies evaluation made it possible to identify a generalized multicomponent mathematical of an estimation of professional competence (Borzykh et al, 2015), its result is determined by general grades for the student's academic achievements, personality evaluation and professional motivation for learning that is fully compliant with the requirements of the Federal State Educational Standard of Higher Education:

$$\overline{PC}_T^{[i]} = f\left(\overline{AA}_T^{[i]}, \overline{PQ}_T^{[i]}, \overline{PM}_T^{[i]}\right), (i = \overline{1:S}, T = const)$$

Where

$\overline{PC}_T^{[i]}$ is general assessment of the *i* professional competence in the T period;

$\overline{AA}_T^{[i]}$ is general assessment of academic achievements for the *i* professional competence in the T period;

$\overline{PQ}_T^{[i]}$ is general assessment of personality evaluation for the *I* professional competence in the T period;

$\overline{PM}_T^{[i]}$ is a general assessment of professional motivation for the *i* professional competence in the T period.

Thus, the task of the level of formation of student professional competencies evaluation is reduced to a phased presentation of the results of educational and other activities.

In the educational system, in the conditions of a competence based approach, the results of students' academic achievements should be presented in the form of formed competencies (general, professional, etc.) (Haddouchane et al, 2017; Muñoz and Araya, 2017), that determine the qualification model of a specialist, should be decomposed into the components "know – be able – own". Likewise, the results of disciplines development as well as competencies should be presented in the form of formed knowledge, efficiencies, proficiencies (Table 4).

**Table 4.** The result of the discipline development

| Discipline | Components | Grades | Allied disciplines | Coefficient of the components significance |
|---|---|---|---|---|
| Dj | knowledge | $z_{j_1}^{[i]}$ | D2, D7, D11 | $\alpha_1^{[i]}$ |
| | | ... | ... | ... |
| | | $z_{j_\alpha}^{[i]}$ | D4, D8, D19 | $\alpha_a^{[i]}$ |
| | efficiencies | $u_{j_1}^{[i]}$ | D3, D5, D8, D21 | $\beta_1^{[i]}$ |
| | | ... | ... | ... |
| | | $u_{j_\beta}^{[i]}$ | D4, D11, D16, D21 | $\beta_b^{[i]}$ |
| | proficiencies/skills | $v_{j_1}^{[i]}$ | D4, D18 | $\gamma_1^{[i]}$ |
| | | ... | ... | ... |
| | | $v_{j_\gamma}^{[i]}$ | D11, D15, D24 | $\gamma_c^{[i]}$ |

Since the formed professional competencies are a system of knowledge, efficiencies and skills to apply them in practice in professional activities (Kadralinova, 2015; Leontyev et al, 2016), and "knowledge – efficiencies – proficiencies" are defined by some set of disciplines, in order to measure competences, it is necessary to determine the quantitative evaluation of knowledge, efficiencies, proficiences, taking into account the interconnections of disciplines (Figure 7).

Evaluation of student learning activities is a convolution of private evaluations of the i professional competence, that are studied and measured in different disciplines, they form the measured i professional competence:

$$\begin{cases} \overline{AA}_T^{[i]} = \sum_{j=1}^{T} \overline{AA}_{D_j}^{[i]}, (j = \overline{1:T}, i = \overline{1:S}), \\ \overline{AA}_{D_j}^{[i]} = \sum_{j=1}^{T}\sum_{k=1}^{a} \alpha_k^{[i]} \bar{z}_{j_k}^{[i]} + \sum_{j=1}^{T}\sum_{k=1}^{b} \beta_k^{[i]} \bar{u}_{j_k}^{[i]} + \sum_{j=1}^{T}\sum_{k=1}^{c} \gamma_k^{[i]} \bar{v}_{j_k}^{[i]}, \\ \alpha_k^{[i]} = \frac{q(z)_k^{[i]}}{T}, \beta_k^{[i]} = \frac{q(u)_k^{[i]}}{T}, \gamma_k^{[i]} = \frac{q(v)_k^{[i]}}{T}, \end{cases}$$

Where

$(\overline{AA}_{D_j}^{[i]}$ ( is assessment of the collection of components of "knowledge – efficiencies – proficiencies" by j discipline participating in the formation of the i professional competence;

$\alpha_k^{[i]}$, $\beta_k^{[i]}$, $\gamma_k^{[i]}$ is significance coefficients of the "knowledge – efficiencies – proficiencies" components of the j discipline participating in the formation of the i professional competence;

$\bar{z}_{j_k}^{[i]}$, $\bar{u}_{j_k}^{[i]}$, $\bar{v}_{j_k}^{[i]}$ is assessment of the appropriate "knowledge – efficiencies – proficiencies" components of the j discipline participating in the formation of the i professional competence;

$q(z)_k^{[i]}$, $q(u)_k^{[i]}$, $q(v)_k^{[i]}$ is the number of disciplines involved in the formation of appropriate "knowledge – efficiencies – proficiencies" components of i professional competence;

T is the number of all disciplines of certain educational programs;

S is the number of all professional competencies in one exact course;

a, b, c are the number of evaluation components of the j discipline;

⊠ is the number of disciplines that form the i professional competence.

Thus, evaluation of professional competencies is defined as the result of academic achievements and is a convolution of private evaluations ("knowledge", "efficiencies", "proficiencies") in reference to all educational disciplines that form considered competencies.

## Software Implementation of Mathematical Model of Evaluation of Graduate Professional Competences Formation

There are both separate powerful analytical applications integrated with database management and LMS systems and tools that work directly in the Microsoft Office environment to solve the problem of evaluation of the levels of formation of professional competences. Programs are able to provide users with time-sensitive information that is necessary for effective decision-making on the choice of further directions for the development of an educational establishment development. The question remains relevant for educators to choose from existing data analysis tools and their adaptation for data processing for widespread implementation in the process of learning monitoring and managing the tools that will be available and easy to study and use.

An implemented prototype of software tools in the programming language R was proposed in this study to solve the problem of evaluation of the levels of formation of professional competences in the qualification model of a specialist. The choice of the prototype is due to the following reasons (Kabakov):

- It is a free, functional, open source programming language;
- R programming environment is cross-platform and the applications created in it can be used without modification in the operating systems Windows, Unix, Linux;
- the R language was developed with the focus on effective statistical processing of data bulk;
- the R language includes several powerful graphics systems and is currently one of the best multidimensional data visualization environments.

The lattice package was used to implement the required functions of displaying information in software tools for graphics output. The lattice package is a powerful and elegant high-level data visualization system with a focus on multidimensional data and aimed at developing Trellis graphics for R language to meet typical graphic needs with minimum setting.

The developed software tool provides an opportunity to analyze the formation level of competencies both taking together study groups within the field of study and the corresponding curriculum and within the specified group and the particular student. An expert assessment of students' professional competence formation was used to process large data samples and visualize the results of calculations

Figure 8 presents diagram that shows that all data processing work is performed automatically in a software script.

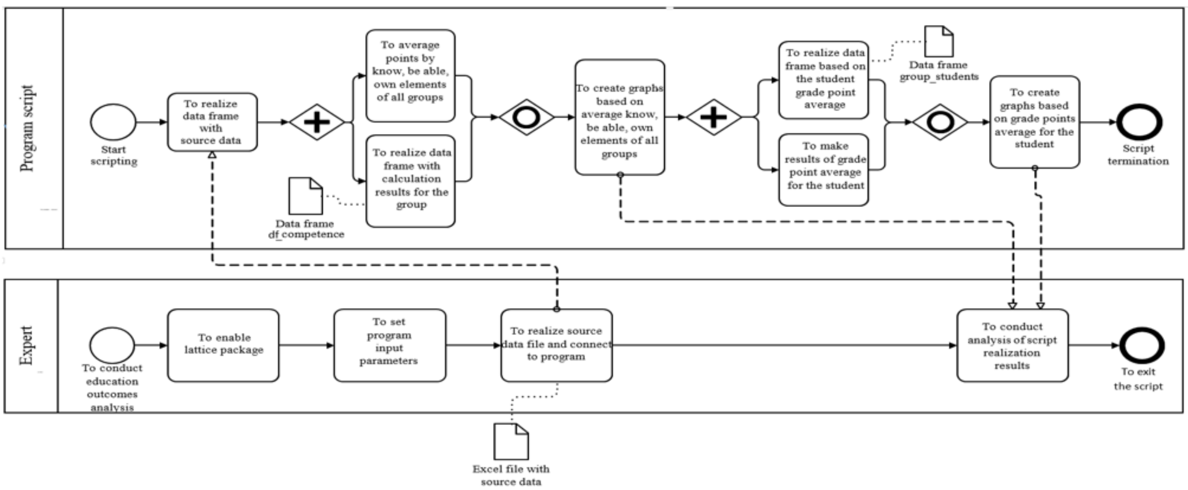


**Figure 8.** The procedure of program script on competence formation analysis

The implementation of software tools was based on an algorithm that includes the following steps:

(1) Preparation and loading of source data.

(2) Computation of the average grade of tested students on the elements «know», «be_able», «own»

(3) Analysis of drilling results and their visualization.

## Formation of The Initial Sample for The Analysis of Educational Data

The file, that was generated in the Excel, was used as the source data. This file contains the information about the test results of 10 study groups with 11 courses of the current curriculum of students studying in IT faculties. During testing, students received final grades on a scale from 1-5 for each course ranked by three elements: «know», «be_able», «own».

In this study students are made anonymous for the most objective assessment. Figure 9 shows the first and the last five lines of the Source Data.xlsx file content.

| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| 1 | discipline | part | competence | group | student | know | be_able | own | num |
| 2 | IS-1 | 0.4 | PK-4 | Gr.01 | Student_001 | 4 | 4 | 4 | 1 |
| 3 | IS-1 | 0.4 | PK-4 | Gr.01 | Student_002 | 4 | 4 | 4 | 2 |
| 4 | IS-1 | 0.4 | PK-4 | Gr.01 | Student_003 | 5 | 4 | 3 | 3 |
| 5 | IS-1 | 0.4 | PK-4 | Gr.01 | Student_004 | 4 | 4 | 4 | 4 |
| 6 | IS-1 | 0.4 | PK-4 | Gr.01 | Student_005 | 4 | 3 | 4 | 5 |
| ... | | | | | | | | | |
| 2755 | Modern database technology and in | | PK-3 | Gr.10 | Student_193 | 4 | 4 | 3 | 13 |
| 2756 | Modern database technology and in | | PK-3 | Gr.10 | Student_194 | 5 | 3 | 4 | 14 |
| 2757 | Modern database technology and in | | PK-3 | Gr.10 | Student_195 | 5 | 5 | 5 | 15 |
| 2758 | Modern database technology and in | | PK-3 | Gr.10 | Student_196 | 5 | 5 | 4 | 16 |
| 2759 | Modern database technology and in | | PK-3 | Gr.10 | Student_197 | 4 | 4 | 4 | 17 |

**Figure 9.** Part of Source data.xlsx file (the first and the last five lines)

Data frame with the source data intended to data processing is updated at the beginning of the script in the global environment R. The df_competence data frame includes the name of the discipline, the name of the competence, the number of the student group, the symbolic name of the student, the values for the elements "know", "be able", "own", the serial number of the student, as well as the average for all of the elements. Figure 10 shows the first and the last five lines of the df_competence data frame.

| | discipline | competence | group | student | know | be_able | own | num | mean |
|---|---|---|---|---|---|---|---|---|---|
| 1 | IS-1 | PK-4 | Gr.01 | Student_001 | 4 | 4 | 4 | 1 | 4.000 |
| 2 | IS-1 | PK-4 | Gr.01 | Student_002 | 4 | 4 | 4 | 2 | 4.000 |
| 3 | IS-1 | PK-4 | Gr.01 | Student_003 | 5 | 4 | 3 | 3 | 4.000 |
| 4 | IS-1 | PK-4 | Gr.01 | Student_004 | 4 | 4 | 4 | 4 | 4.000 |
| 5 | IS-1 | PK-4 | Gr.01 | Student_005 | 4 | 3 | 4 | 5 | 3.667 |
| ... | | | | | | | | | |
| 2754 | Modern database technology and inform... | PK-3 | Gr.10 | Student_193 | 4 | 4 | 3 | 13 | 3.667 |
| 2755 | Modern database technology and inform... | PK-3 | Gr.10 | Student_194 | 5 | 3 | 4 | 14 | 4.000 |
| 2756 | Modern database technology and inform... | PK-3 | Gr.10 | Student_195 | 5 | 5 | 5 | 15 | 5.000 |
| 2757 | Modern database technology and inform... | PK-3 | Gr.10 | Student_196 | 5 | 5 | 4 | 16 | 4.667 |
| 2758 | Modern database technology and inform... | PK-3 | Gr.10 | Student_197 | 4 | 4 | 4 | 17 | 4.000 |

**Figure 10.** Part of df_competence data frame (the first and the last five lines)

Thus, a file was generated, that contains the results of students testing for their subsequent processing. Trough the software tools work, this file was transformed into a one that can work through the programming language R.

## Data Processing with The Use of Software Tools

The calculation of the students grade point average within the formed competencies for the elements “know”, “be able”, “own” is performed in the following commands (Listing 1).

Listing 1

```
# Computation of the average on the elements «know», «be_able», «own» in each group
students.cnt <- length(unique(df_competence[,”student”]))
num <- df_competence[1:students.cnt,”num”]
students <- aggregate(cbind(know, be_able, own, mean) ~ group + student,
                      data = df_competence, mean)
group <- students$group[students$student==student]
group.students <- students[students$group==group,]
rownames(group.students) <- 1:nrow(group.students)
```

The calculation results (Listing 1) are represented in graphs that allows to evaluate visually students’ competencies formation.

A data frame df_student is created to receive the information about the student through the software script (Listing 2). Graphics rendition of the scripting result is shown in Figure 11.

Listing 2

```
# Data analysis of competencies’ formation of the student
df.student <- df_competence[df_competence$student == student,c(1:3, 5:9)]
group <- as.character(df.student$group[1])
num <- df.student$num[1]
caption <- paste(group,”: “, num, “. “, student, sep = “”)
cat(“\n”, caption, “\n”, sep=””)
cat(“----------------------\n”)
df.student <- df.student[,c(“discipline”, “competence”, “know”, “be_able”, “own”, “mean”)]
print(df.student)
cat(“\nKnow:”)
cat(“\n-------”)
print(table(df.student$discipline, df.student$know))
cat(“\nbe_able:”)
cat(“\n-------”)
print(table(df.student$discipline, df.student$be_able))
cat(“\nown:”)
cat(“\n-----------”)
print(table(df.student$discipline, df.student$own))
```

| | discipline | competence | know | be_able | own | mean |
|---|---|---|---|---|---|---|
| 187 | IS-1 | PK-4 | 3 | 4 | 5 | 4.000 |
| 384 | IS-2 | PK-4 | 4 | 3 | 4 | 3.667 |
| 581 | POIS-1 | PK-6 | 3 | 3 | 4 | 3.333 |
| 778 | POIS-2 | PK-6 | 5 | 4 | 4 | 4.333 |
| 975 | Computer graphics | OPK-3 | 4 | 5 | 5 | 4.667 |
| 1172 | Computer graphics | PK-2 | 4 | 3 | 3 | 3.333 |
| 1369 | Application programming | OPK-4 | 4 | 5 | 4 | 4.333 |
| 1566 | Application programming | PK-8 | 3 | 4 | 3 | 3.333 |
| 1763 | Web programming | PK-7 | 4 | 5 | 4 | 4.333 |
| 1960 | Web programming | PK-8 | 4 | 4 | 5 | 4.333 |
| 2157 | OOP-1 | PK-6 | 5 | 4 | 4 | 4.333 |
| 2354 | OOP-2 | PK-6 | 3 | 4 | 4 | 3.667 |
| 2551 | Design workshop | PK-8 | 4 | 4 | 5 | 4.333 |
| 2748 | Modern database technology and informatio... | PK-3 | 3 | 3 | 4 | 3.333 |

**Figure 11.** The contents of the df_student data frame

The presented chunks of code show the process of the educational data processing for further analysis through the programming language R.

## The visualization of the results of educational data analysis with the use of software tools

The results of knowledge, efficiencies and skills formation of students within professional competencies for 10 test groups are shown in Figure 12. The graphs depict the level of students professional competencies formation.

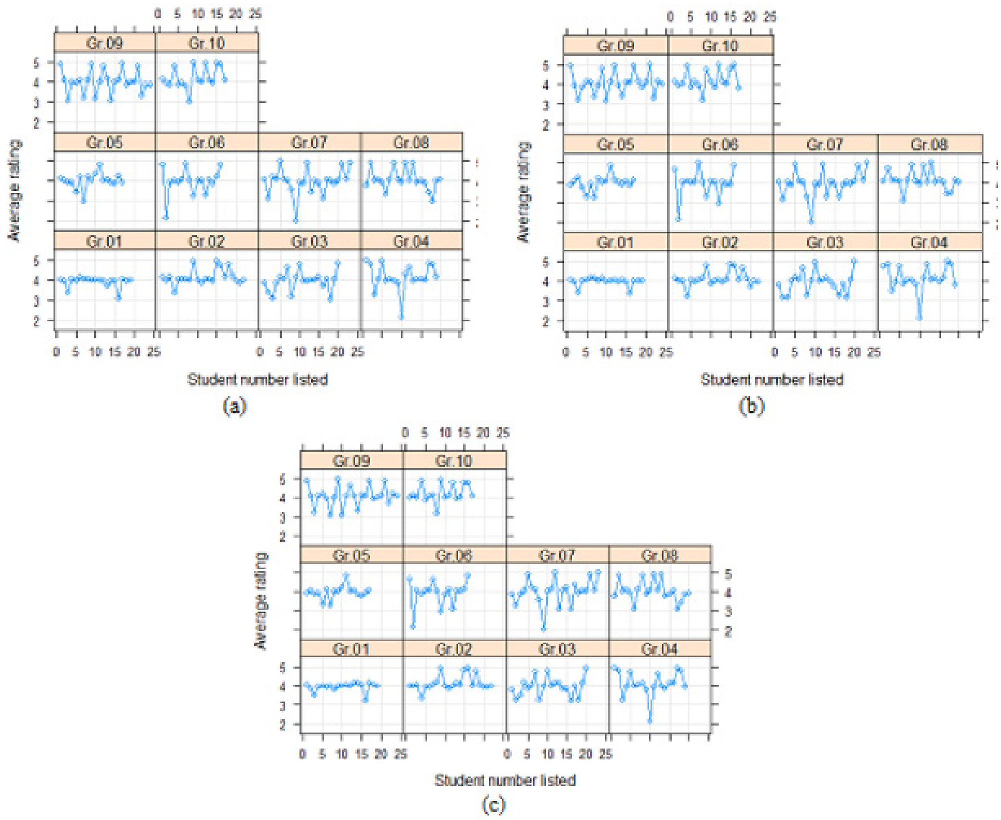


**Figure 12.** The average result of knowledge (a), efficiencies (b) and skills (c) formation for 10 test groups

So, for example, it can be seen that the average level of all students knowledge in group 01 is mostly within 4 points, i.e., competencies formation on the element of "knowledge" is at one level in this group. In groups 04 and 07 the average level of knowledge formation varies from 2 to 5 points, which shows different level of theoretical material learning within the group.

In the following graph (Figure 13): the average for the average results of the elements "know", "be able", "own".

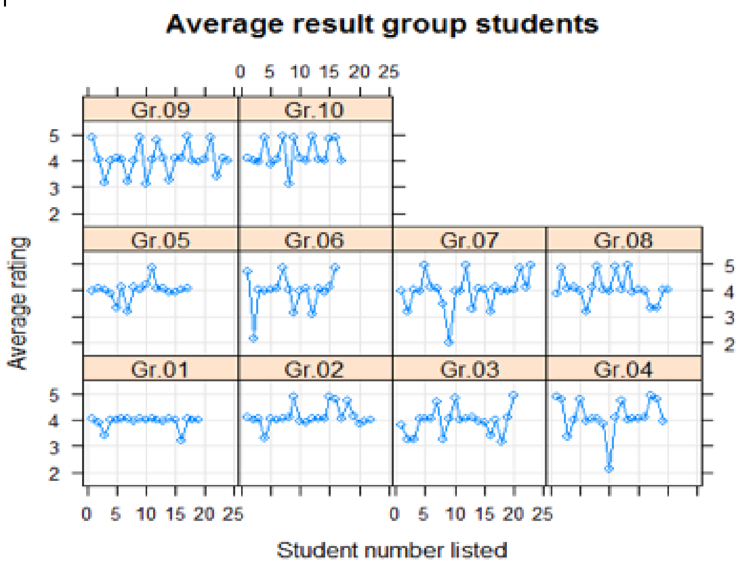


**Figure 13.** Average points for all competence elements of 10 test groups

Overall, the graphs allow to identify the weakest and the most powerful groups of students in professional competencies mastering. Thus, it can be determined that the most "strong" group after analyzing academic performance charts is 10th of the 10 tested groups. The main students contingent of the selected group has an grade point average of 4 or 5 for all "know", "be able", "own" elements, which show a high level of professional competencies formation and the disciplines mastering at a sufficiently high level. A similar conclusion can be on the 02th group.

At the same time, it is clear that the level of competence formation in 01th group is stably average. Average points for "know", "be able", "own" elements within the group is 4 points. The results of other groups range from 3 to 5 points, in some cases 2 points were fixed.

One can determine the level of particular student competencies formation by analyzing all tested groups and receive the display of information about the average points for "know", "be able", "own" elements in all disciplines of the current curriculum involved in the professional competencies formation (Figure 14).

```
> print(table(df.student$discipline, df.student$know))

                                                      3 4 5
  Application programming                             1 1 0
  Computer graphics                                   0 2 0
  Design workshop                                     0 1 0
  IS-1                                                1 0 0
  IS-2                                                0 1 0
  Modern database technology and information analysis 1 0 0
  OOP-1                                               0 0 1
  OOP-2                                               1 0 0
  POIS-1                                              1 0 0
  POIS-2                                              0 0 1
  Web programming                                     0 2 0
```

(a)

```
> print(table(df.student$discipline, df.student$be_able))

                                                      3 4 5
  Application programming                             0 1 1
  Computer graphics                                   1 0 1
  Design workshop                                     0 1 0
  IS-1                                                0 1 0
  IS-2                                                1 0 0
  Modern database technology and information analysis 1 0 0
  OOP-1                                               0 1 0
  OOP-2                                               0 1 0
  POIS-1                                              1 0 0
  POIS-2                                              0 1 0
  Web programming                                     0 1 1
```

(b)

```
> print(table(df.student$discipline, df.student$own))

                                                      3 4 5
  Application programming                             1 1 0
  Computer graphics                                   1 0 1
  Design workshop                                     0 0 1
  IS-1                                                0 0 1
  IS-2                                                0 1 0
  Modern database technology and information analysis 0 1 0
  OOP-1                                               0 1 0
  OOP-2                                               0 1 0
  POIS-1                                              0 1 0
  POIS-2                                              0 1 0
  Web programming                                     0 1 1
```

(c)

**Figure 14.** The average points of knowledge (a), efficiencies (b) and proficiencies (c) in all disciplines for Student_187

Figure 15 presents the average grade points of the student in all disciplines involved in the professional competencies formation.

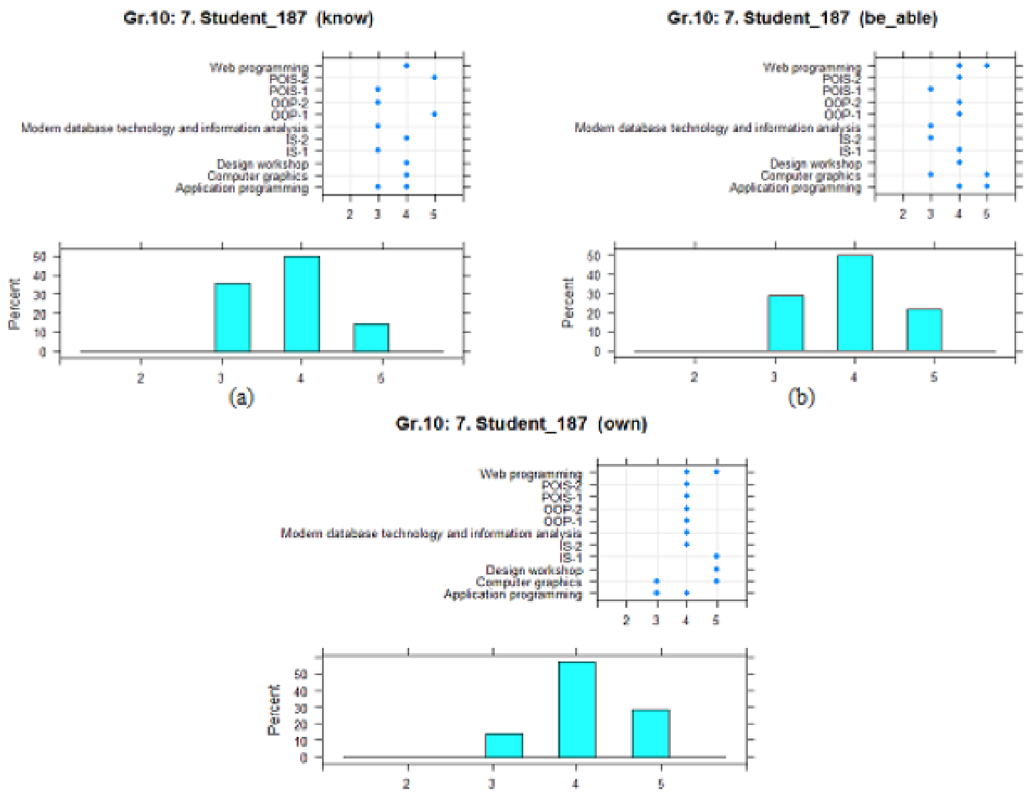


**Figure 15.** The average grade points of knowledge (a), efficiencies (b) and proficiencies (c) in all disciplines for Student_187

The presented graphs show the results of the student. It can be seen that in all disciplines of the curriculum there are mainly 5 points, in addition, there are no results below 4 points. These results demonstrate high grades of student Student_187 and show the the curriculum disciplines mastering mainly from 90 to 100%, which shows sufficiently high level of professional competence formation. The graphs visualize the results of the entire learning process and allow to conclude about the level of the student professional training based on a competence based approach.

Therefore, it is possible to analyze final grades of any student of the given sample. To process a new selection, one should enable at the beginning of the program script prepared for processing .csv file or a MySQL database.

The proposed script can be used for processing large amounts of educational data, and the powerful graphing capabilities of the lattice package allow to visualize the calculations results. Presentation of analysis results in the form of diagrams and graphs makes it possible to analyze the received information in visual mode, for example, to identify students status in the academic ranking within the group.

Developed application of academic performance evaluation can be used in the educational process to analyze students professional competence formation. It will allow to make timely adjustments to the organization of the educational process, plan the learning process in a specific discipline.

## CONCLUSION

This study shows the influence of the results of the analysis and visualization of educational data on the process of the curriculum improvement and their reflection on the specialist qualification model formation organized on the basis of the competence based approach to graduate training in accordance with the educational standards requirements. The proposed approach can be used to develop more result-oriented educational program by redesigning it with consequent elimination of identified gaps in the consideration of important learning outcomes and educational program evaluation using an updated visual model of evaluation activity.

Different types of models providing the opportunity to observe and analyze the entire educational program from different points of view and in general were constructed with the usage of the visualization methods of educational data (Figures 1-5): to define the relationship between the most focused and evaluated learning outcomes by showing the educational program trend to knowledge, efficiencies and skills to determine the degree of their participation in the learning outcomes formation; to identify unformed learning outcomes and gaps. The proposed visual script model of the curriculum data analysis shows the ability to define presence or absence of lacks and contradictions in the existing curriculum for executive decision-making aimed at amendment and learning outcomes formation in accordance with educational standards.

Visualization of the need to redesign the IT specialist educational training program identified the demand for a quantification of the level of students' competencies used in the basis of the mathematical formulation of task of the specialist's qualification model organization, the model includes a set of qualification units and results of professional competencies formation evaluaton through the interconnection of their components: "knowledge – efficiencies – proficiencies".

A prototype of software tools in the programming language R is presented. The prototype allows to demonstrate the dynamics of curriculum disciplines mastering and the educational results of a student and a group on the basis of the mathematical formulation of task of the specialist's qualification model organization. This allows to see the results of the educational program mastering by students, to draw a conclusion about the level of graduates' professional competencies formation and to evaluate the efficiency of the program. The developed application for the students' professional competence formation based on the ranking of components assessments: "knowledge – efficiencies – proficiencies" helps to identify soft spots in the educational program for future improvement of the educational process organization and its planning.

The proposed script for the visualization automation and analysis of educational data will provide a better approach to the educational programs formation in the field of training of highly qualified specialists with the requierd rate of professional competences.

Thus, the visualization of educational data analysis is focused on the identification of gaps and inconsistencies in data, giving the opportunity to verify the conformity of learning activity with educational standards. The visualization of educational data analysis allows to easy acquire the structure of the data; to determine the reasons for their use and the importance of the obtained results. The visualization of educational data analysis helps to manage the divergences and structural defects, that were identified as a result of gap analysis, presence of constructive alignment in the data.

The results of the study can be used to model the script of teaching activities in order to eliminate all kinds of gaps in the preparation of graduates and their professional competencies evaluation. The proposed approach can be used to build more result-oriented educational program by redesigning it to eliminate identified gaps in the consideration of important learning outcomes (the level of graduates' professional competencies formation) and evaluate the educational program using an updated visual model of evaluation activity.

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## REFERENCES


Adejo, O., & Connolly, T. (2017). Learning Analytics in Higher Education Development: A Roadmap. *Journal of Education and Practice,* 8(15), 156-163.

Agasisti, T., & Bowers, A. J. (2017). Data Analytics and Decision-Making in Education: Towards the Educational Data Scientist as a Key Actor in Schools and Higher Education Institutions. *Handbook of Contemporary Education Economics*, 184-210. https://doi.org/10.7916/D8PR95T2

Blazar, D., & Kraft, M. A. (2017). Teacher and teaching effects on students' attitudes and behaviors. *Educational evaluation and policy analysis*, 39(1), 146-170. https://doi.org/10.3102/0162373716670260

Borzykh, V.E., Shalkina, T.N., & Nikolaeva, D.R. (2015). Method of mathematical modeling of graduates professional competencies evaluation process. *Modern problems of science and education*, 1-1, 106.

Braganza, A., Brooks, L., Nepelski, D., Ali, M., & Moro, R. (2017). Resource management in big data initiatives: Processes and dynamic capabilities. *Journal of Business Research*, 70, 328-337. https://doi.org/10.1016/j.jbusres.2016.08.006

Breiter, A., & Light, D. (2006). Data for School Improvement: Factors for designing effective information systems to support decision-making in schools. *Educational Technology & Society*, 9(3), 206-217. https://www.ifib-consult.de/publikationsdateien/Breiter_Light-2006.pdf

Cashman, D., Humayoun, S. R., Heimerl, F., Park, K., Das, S., Thompson, J., Saket, B., Mosca, A., Stasko, J., Endert, A., Gleicher, M., & Chang, R. (2019) A User-based Visual Analytics Workflow for Exploratory Model Analysis. *arXiv:1809.10782v3 [cs.HC].* https://arxiv.org/pdf/1809.10782.pdf

Cech, T., Spaulding, T. & Cazier, J. (2018). Data competence maturity: developing data-driven decision making. *Journal of Research in Innovative Teaching & Learning*, 11(2), 139-158.

Choi, I. K., Childers, T., Raveendranath, N. K., Mishra, S., Harris, K., & Reda, K. (2019). Concept-Driven Visual Analytics: an Exploratory Study of Model-and Hypothesis-Based Reasoning with Visualizations. *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, ACM, 68, 1-14. https://doi.org/10.1145/3290605.3300298.

Custer, S., King, E. M., Atinc, T. M., Read, L., & Sethi, T. (2018). Toward Data-Driven Education Systems: Insights into Using Information to Measure Results and Manage Change. *Center for Universal Education at The Brookings Institution*. https://www.brookings.edu/wp-content/uploads/2018/02/toward-data-driven-education-systems.pdf

Davari, M., Noursalehi, P. & Keramati, A. (2019). Data mining approach to professional education market segmentation: a case study. *Journal of Marketing for Higher Education*, 29(2), 45-66. https://doi.org/10.1080/08841241.2018.1545724

The Federal State Educational Standards of Higher Education (FSES HE), Retrieved 08 April, 2020 from http://fgosvo.ru/fgosvo/151/150/24

Fomina, L. V., & Shmeleva, Zh. N. (2019). Practical experience of training specialists in personnel management at the krasnoyarsk state agrarian university. *ANI: Economics and Management*, 1(26). 365-369. https://cyberleninka.ru/article/n/practical-experience-of-training-specialists-in-personnel-management-at-the-krasnoyarsk-state-agrarian-university

Gitman, M. B., Danilov, A. N., & Stolbov, V.Yu. (2014). Modern data analysis methods. *Open education*, 1(102), 24-31. https://openedu.rea.ru/jour/article/view/129

Gorlushkina, N.N., Kocyuba, I.Yu., & Khlopotov, M.V. (2015). Problems and methods of educational data mining to support decision making. *OTO*, 1, 472-482.

Haddouchane, Z. A., Bakkali, S., Ajana, S., & Gassemi, K. (2017). The application of the competency-based approach to assess the training and employment adequacy problem. *International Journal of Education (IJE).* 5(1), 1-18. https://doi.org/10.5121/ije.2017.5101

Kabakov, R.I. (2014) R in action. Analysis and visualization of data in R programm. *Moscow. DMK Press*, 588.

Kadralinova, M.T. (2015) Competence-based approach as solution of education quality. *Education through life: continuing education in the field of development study,* 13, 417-419.

Keim, D., Andrienko, G., Fekete, J-D., Gorg, C., Kohlhammer, J., & Melancon, G. (2008) Visual analytics: Definition, process, and challenges. *Human-Centered Issues and Perspectives, Springer,* 154-175, https://doi.org/10.1007/978-3-540-70956-5_7

Khan, M., & Khan, S. S. (2011) Data and information visualization methods, and interactive mechanisms: A survey. *International Journal of Computer Applications*, 34(1), 1-14.

Kulasegaram, K., & Rangachari, P. K. (2018) Beyond "formative": assessments to enrich student learning. *Advances in physiology education*, 42(1), 5-14, https://doi.org/10.1152/advan.00122.2017

Kumar, K., & Vivekanandan, V. (2018), Advancing learning through smart learning analytics: a review of case studies. *Asian Association of Open Universities Journal*, 13(1), 1-12, https://doi.org/10.1108/AAOUJ-12-2017-0039

Leontyev, V. V., Rebrina, F. G., Leontyeva, I. A., & Gafiyatullina E. A. (2016) Evaluation of the Development of Professional Competence in Undergraduates: Methodical Aspects. *International Journal of Environmental and Science Education*, 11(14), 6592-6602.

Linan, L. C., & Perez A. A. J. (2015) Educational Data Mining and Learning Analytics: differences, similarities, and time evolution. *International Journal of Educational Technology in Higher Education*, 12(3), 98-112, http://dx.doi.org/10.7238/rusc.v12i3.2515

Masino, S., & Nino-Zarazua, M. (2016) What works to improve the quality of student learning in developing countries? *International Journal of Educational Development*, 48, 53-65, https://doi.org/10.1016/j.ijedudev.2015.11.012

Munoz, D. R., & Araya, D. H. (2017) The challenges of competence-based assessment in the educational field. *Educacao e Pesquisa*, 43(4), 1073-1086, https://doi.org/10.1590/s1678-4634201706164230

Murumba, J., & Micheni, E. (2017) Big Data Analytics in Higher Education: A Review. *The International Journal of Engineering and Science (IJES),* 6(6), 14-21, http://dx.doi.org/10.9790/1813-0606021421

Oyerinde, Y. & Olu Bankole, F. (2015). Big Data in Education: Learning Analytics Techniques and Implementations for Predicting Students Academic Performance. https://doi.org/10.13140/RG.2.1.4004.3286

Occupational standards: 06 Communication, information and communications technology, Retrieved 08 April, 2020 from http://fgosvo.ru/docs/101/69/2/6

Rehman, S., & Mehmood, DR. A. (2014). Employability skills : the need of the graduates and the employer. *VSRD International Journals of Business and Management Research,* 4(IV), 133-138.

Ukuev, B.T. (2018) Experience of introduction of innovative methods of training of bachelors and masters in the field of information technologies. *Open Education*. 22(3), 83-90, https://doi.org/10.21686/1818-4243-2018-3-83-90

Utyomov, V.V., & Gorev, P.M. (2018) Development of educational systems on the basis of Big Data technology. *Concept*, 6, 449-461.

Vaitsis, C., Hervatis, V., & Zary, N. (2016) Introduction to Big Data in education and its contribution to the quality improvement processes. *Big Data on Real-World Applications*, 113, http://dx.doi.org/10.5772/63896

Zavadsky, J., Korenkova, V., Zavadska, Z., Kadarova, J., & Tucek, D. (2019) Competences in the Quality Management System Evaluation Based on the Most Worldwide Used Key Performance Indicators. *Quality-Access to Success*, 20(169), 29-41.

# ONLINE COMPONENT CHALLENGES OF A BLENDED LEARNING EXPERIENCE: A COMPREHENSIVE APPROACH

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## ABSTRACT

This study aims to investigate: (1) the construct validity of the "Blended Learners' Online Component Challenges" BLOCC scale. (2) the internal reliability of the scale, and (3) the differences between blended learners' online component challenges according to different socio-demographic variables for Sport Science students. The sample of the study consisted of 263 students enrolled in blended learning classes at the School of Sport Sciences/ University of Jordan. The BLOCC scale was used to collect the required data. The scale measures the four different online component challenges; (1) Self-Management Challenges (SMC), (2) Technology Competency and Literacy Challenges (TCLC), (3) Student Isolation Challenges (SIC), and (4) Technological Sufficiency and Complexity Challenges (TSCC). BLOCC scale proved to be valid and reliable (four items were omitted); The overall fit statistics for the hypothesized four factor model ($\chi2$ (df = 2.69) = 603.47, $p < 0.001$, (RMSEA) = .08 indicated a moderate and acceptable fit to the data representing the latent factor structure. Discriminant validity ranged between .53 and .70., Item-to-total correlation (.55 and .72), Cronbach Alpha (.72 and .86), and composite reliability (.74 -.95). Results of the study revealed that male students, students who have no internet accessibility, and those who have no previous experience in blended learning classes, all encountered significant higher levels of all BLOCC subscales. Older students (26-30 years old), and those with the lowest total income/ month (< 500 JD) encountered significant levels of TLCC and TSCC. Students with lower literacy in computer skills level encountered significant differences in SMC, TLCC and TSCC. We encourage future studies to propose and implement curative approaches to face such online component challenges.

**Keywords:** Blended learning, higher education, scale validation, online component challenges.

## INTRODUCTION

At the beginning of 2000, Blended Learning (BL) became a popular pedagogical concept (Guzer, & Caner, 2014). It meets the needs of different learners, learning goals, and learning environments, (Stubbs et al., 2006). The social constructivist approach is used to transform teaching traditional modules into the BL approach, moreover, support educational differentiation, reduce lecturing time, and support repetition (Dalsgaard & Godsk, 2007).

BL is considered as an important pedagogical design. It is defined as an effective combination of online and Face to Face (FTF) education, careful planning of the online component needs to take into consideration the capacity of the institutions, the subject matter, and student's needs to optimize the use of active learning strategies (Dos, 2014). BL exposes students to an authentic learning experience with flexible active learning and greater feedback (Bonk et al., 2002).

Potentially BL can improve the learning and satisfaction of both students and instructors at a reasonable cost (Bourne et al., 2005; Pizzi, 2014). Undergraduate course students revealed overall satisfaction and positive perception towards implementing the BL model. They were satisfied with online quizzes and interactive content. Moreover, student-led activities and student-centered practices, particularly collaborative projects, were key themes for effective instructional strategies (Dos, 2014; Tamim, 2018). Students engaged in BL courses reported high levels of interaction with their teachers (Napier et al., 2011).

Information and communication technologies are identified as providers of learning advantages, along with traditional methods such as lectures. Since the beginning of the 21st century, computer network technology has brought enormous transformation to people's life (Le, 2011; Mitchell & Forer, 2010). Online material had to be engaging, interactive, and complement the FTF classes (Keogh et al., 2017).

To support learners using a distance learning model, the BL approach delivers learning resources and activities using a virtual learning environment (Hughes, 2007). A Moodle is used to effectively facilitate the BL process. It is an open-source software package and a model of interaction among learners and educators, through which learning experiences and outcomes become more vivid and outstanding (Zhou et al., 2017). Moodle platform helps to configure homework, online forums, and other related activities. Also, it optimizes the communication modes in the teaching process in which seminar, chat, and forum modules provide a variety of exchanging platform for both students and teachers (Feng, 2018). Moreover, BL assists educators to online track and target 'at risk' learners more quickly (Hughes, 2007).

The last few years have registered a remarkable increase in Internet use in education, Also, higher educational institutions continuously invested in integrating the technology components into their course offerings (Bailey & Morais, 2005). BL is still in its early stages in the University of Jordan but is getting increased attention and recognition from students, teachers, and stakeholders. As it is the case of other Arab countries such as the United Arab Emirates (Tamim, 2018). Although, advocates of a BL course portray an ideal picture of participants enjoying learning and revealing how they can employ their new experiences. The truth is, of course, much more complicated, especially for working adults (Tay, 2016).

## Purpose of the Study

School of Sport Sciences at the University of Jordan teach both practical and theoretical classes. Recently, some of these classes started to implement the blended learning approach. In this study we will focus on some of these theoretical blended learning classes such as Sport Psychology, motor learning and Life Skills. We need to address and understand the online component challenges our students face, so we can improve their learning experience and environment. The "Blended Learners' Online Component Challenges" Scale (BLOCC) which was developed and preliminary validated by (Bayyat et al., 2020) will help to shed the light on these challenges, provide further tests on the scale, and to furthermore check that the validity and reliability of the scale. Also, to determine whether the scale can identify differences in BLOCC according to different socio demographic variables.

Statement of the problem: The present study was designed to test and assess the following:

1. The scale's construct validity by investigating whether the scale produces responses measuring the construct "Blended Learners' Online Component Challenges", and whether the four specific online component dimensions identified previously would be found with a diverse sample of students.
2. The internal reliability of the scale by investigating whether the different items seem to be measuring the same dimension in each subscale produces results that are internally consistent.
3. The differences between blended learners' online component challenges (dependent variables) according to different demographic variables (independent variables); (1) gender, (2) internet accessibility, (3) previous experience in BL courses, (4) job status, (5) marital status, (6) student's nationality, (7) province, (8) age, (9) total income per month, (10) literacy in computer skills, and (11) academic year.

## Significance of the Study

Most previous studies in blended learning focused on planning, managing and evaluating the activities of a blended learning class without considering students' perception of their own learning and experience regarding online component challenges they encounter, In addition to investigating different variables, previously mentioned, that might affect students encountering such challenges.

## METHOD

To fulfil the objectives of this study, the descriptive approach was conducted using the quantitative method and applying the survey design.

## Participants

The initial number of the opportunity sample participated in our study was 272 samples for the 27 items instrument. They were approximately fifty percent of the total number of undergraduate students enrolled in several blended learning classes at the School of Sport Sciences /University of Jordan. Their participation was voluntary. Participants were asked to respond to the "Blended Learners' Online Component Challenges" Scale, they were assured that their responses would be anonymous, and that the results of the study will be used for scientific research only. The study started in November 2019 and was concluded in January 2020.

## Data Collection and Analysis

### The Scale

#### *"Blended Learners' Online Component Challenges" Scale (BLOCC)*

The" Blended Learners' Online Component Challenges" (BLOCC) Scale was adopted to fulfill the purpose of the study, It is a four components scale consisting of twenty seven items. The scale is previously developed and validated, with alpha coefficients values ranging between .72 and .86 for the subscales, and a total of .93 (Bayyat et al., 2020). Compatible with the theoretical review Bower, 2015; Zacharis, 2015; Lightner & Lightner-Laws, 2016; Safford & Stinton, 2016; Szeto and Cheng, 2016; Broadbent, 2017; Chyr et al., 2017; Sun et al., 2017; Akcayir & Akcayir, 2018; AlJarrah et al., 2018; Chuang et al., 2018; Maycock et al., 2018; Prasad et al., 2018; Rasheed et al., 2020), these subscales explain approximately 55% of the construct's total explained variance.

A five-point Likert type scale was used to rate the answers of the scale's questions; the participants' correspondent would range from 1 point to 5 points (never, occasionally, moderately, usually, and always).

The online component challenges consisted of; self-management challenges (SMC), technological literacy and competency challenges (TLCC), students' isolation challenges (SIC), "technological sufficiency and complexity challenges (TSCC)". Each challenge was identified as single and non-ambiguous explained as follows;

SMC involves a set of six challenges reflected through items 1,2,3,4,5 and 6 in the BLOCC scale. Learners might face different challenges in relation to self-regulating their feelings, thoughts, and behavior to fulfil their learning goals. They include poor time management skills, improper utilization of online peer learning strategies, limited preparation before class, procrastination, online help-seeking challenge and lack of self-management skills,

TLCC involves a set of nine challenges reflected through items 7,8,9,10,11,12,13,14 and 15 in the BLOCC scale. Learners might face different challenges in relation to their competency and proficiency in using technology for studying effectively. They include adult learners' intimidation by learning technologies, the challenge of learning new technology by adult learners, handling different user interfaces, lack of technological competency, students' perception of technology as a barrier to online help-seeking. student technological illiteracy, resistance to/or confusion about seeking appropriate online help, a technological distraction from overly complex technology, poor understanding of expectations and directions in "online learning" of blended learning, and resistance to technology,

SIC involves a set of four challenges reflected through items 16,17,18 and 19 in the BLOCC scale. Learners might face different challenges in relation to emotional distress students feel when they study out of their face-to-face classes due to loneliness and isolation from their peers, They include students losing interest in learning and feeling isolated, or do not feel comfortable to be the center of attention during an online session, and students who are not capable of applying the technology related to online classes such as video projection, microphones, and speakers. They include students feeling disinterested and isolated, or feeling uncomfortable being the center of attention during an online class, students isolation and alienation in online learning, students' problems with the use of video projection, the microphones and speakers, and remote.

TSCC involves a set of eight challenges reflected through items 20,21,22,23,24,25,26, and 27 in the BLOCC scale. Learners might face different challenges in relation to access to sufficient online technologies and services for studying or with complex technologies. They include inequality of technological accessibility between students, insufficient access to technology, low bandwidth and slow processing speeds, outdated technology, lack of internet out of the class, experiencing technical difficulties while trying to complete their assignments. technological distraction from overly complex technologies, and challenge with longer videos for learning. The validity and reliability processes in data collection and analyses should be described sufficiently.

## Statistical Analysis

To fulfil our research objectives, we applied the SPSS and AMOS (version 22) software.

Descriptive analysis for demographic information of the sample of the study and for all subscales were calculated, we checked that participants' responses were using the full range of responses (from 1 to 5) throughout the scale. Then, we verified that the distribution of the collected data did not show any evidence of skewness or kurtosis.

Confirmatory factor analysis (CFA) was used to test the BLOCC scale's construct validity, we needed to check that the scale would factor out the four components previously identified in the original study (Bayyat et al., 2020), and that the item loadings are significant.

Reliability of the scale was assessed using different scores of correlations reflecting the Item to total, internal consistency, and composite reliability.

Discriminant validity was checked to emphasize that the subscales of the scale that should not be related are not, or correlate with a minimum degree.

Finally, t-test and one-way ANOVA reflected the ability of the scale to differentiate between different subgroups within the population.

## FINDINGS

We received 272 responses from the undergraduate students enrolled in several blended learning classes at the School of Sport Sciences/University of Jordan; 9 questionnaires (3.3%) were spoiled and eliminated due to missing data, leaving 263 completed questionnaires for analysis.

Demographic information of the participants were reported as follows; 249 (94.7%) were Jordanian, 132 (50.2%) were women and 131 (49.8%) were men;165 (62.7%) were aged under 20 years old, 84 (31.9%) were aged 21-25, and 14 (5.3%) 26-30. 251 (95.4%) were single and 12 (4.6%) were married. 92 (35%) had a job, 133 (50%) were in their first academic year, 69 (26%) in the second year, 21 (8%) in the third year, and 40 (15.2%) in the fourth year. 231 (87.8%) lives in the central territory of Jordan, 28 (10.6%) lives in the northern territory, and only 4 (1.5%) lives in the southern territory. 58 (22.1%) income was < 500 JD/month, 155 (58.9%) was between 500-1000 JD/month, and 50 (19%) was >1000 JD/month. 265 (97.3%) had access to the internet. 136 (51.7%) had previous experience in blended learning classes. 143 (54.4%) had a good level of basic computer skills, 88 (33.5%) were very good, and 32 (12.2%) were excellent.

To fulfil the first and second objective of the study, we need to present the results across the sample (rather than each independent variable), so we can retain confidentiality and anonymity, and because these objectives are intended to be a test of construct validity and internal reliability of the scale.

## Construct Validity

### Confirmatory Factor Analysis (CFA)

We used the structural equations to complete the CFA validation of the BLOCC scale, we needed to check how closely the collected data from the 27 specific items fitted the four-factor model proposed. Using the maximum likelihood method, we ran the CFA from the factor structure obtained previously in the exploratory analysis (Bayyat et al., 2020). The CFA analysis was only conducted for available full data questionnaires (n = 263).

To examine whether the proposed model fits the observed covariation matrix between items, we employed the 'two criteria strategy'; Chi-square statistic and the Root Mean Square Error of Approximation (RMSEA) (Hu & Bentler, 1999). The results shown in Table (1) reflected a moderate Chi-square indication of the overall fit for the four-factor model to the data ($\chi 2$ (df = 2.69) = 603.47, $p < 0.001$, which was within the recommended value of ≤ 5.00 according to Hair et al (2006), while (RMSEA) of .08 estimated the amount of error of approximation per model degree of freedom and takes sample size into account and represent the approximate fit index. According to Marsh et al., (2004), RMSEA of .08 or lower should be acceptable in most cases. Hence, both fit indices indicated that data from the sample fit the model representing the latent factor structure.

**Table 1.** Factor loads and fit indices for the BLOCC scale

| Factor | Item | Initial model | | Developed model | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Standardized loadings | | Standardized loadings | | Fit indices | | |
| | | Loading | sig | Loading | sig | $\chi 2$ | $\chi 2$/df | RMSEA |
| SMC | 1 | 0.67 | < 0.000 | 0.65 | < 0.000 | 603.47 | 2.694 | .80 |
| | 2 | 0.71 | < 0.000 | 0.72 | < 0.000 | | | |
| | 3 | 0.78 | < 0.000 | 0.81 | < 0.000 | | | |
| | 4 | 0.42 | < 0.000 | - | - | | | |
| | 5 | 0.64 | < 0.000 | 0.63 | < 0.000 | | | |
| | 6 | 0.39 | < 0.000 | - | - | | | |
| TLCC | 7 | 0.57 | < 0.000 | 0.56 | < 0.000 | | | |
| | 8 | 0.64 | < 0.000 | 0.63 | < 0.000 | | | |
| | 9 | 0.67 | < 0.000 | 0.68 | < 0.000 | | | |
| | 10 | 0.76 | < 0.000 | 0.76 | < 0.000 | | | |
| | 11 | 0.70 | < 0.000 | 0.66 | < 0.000 | | | |
| | 12 | 0.64 | < 0.000 | 0.59 | < 0.000 | | | |
| | 13 | 0.55 | < 0.000 | 0.55 | < 0.000 | | | |
| | 14 | 0.62 | < 0.000 | 0.63 | < 0.000 | | | |
| | 15 | 0.65 | < 0.000 | 0.66 | < 0.000 | | | |
| | 16 | 0.67 | < 0.000 | 0.67 | < 0.000 | | | |
| SIC | 17 | 0.68 | < 0.000 | 0.69 | < 0.000 | | | |
| | 18 | 0.58 | < 0.000 | 0.58 | < 0.000 | | | |
| | 19 | 0.60 | < 0.000 | 0.60 | < 0.000 | | | |
| | 20 | 0.71 | < 0.000 | 0.71 | < 0.000 | | | |
| TCSC | 21 | 0.53 | < 0.000 | 0.54 | < 0.000 | | | |
| | 22 | 0.65 | < 0.000 | 0.61 | < 0.000 | | | |
| | 23 | 0.48 | < 0.000 | - | - | | | |
| | 24 | 0.71 | < 0.000 | 0.72 | < 0.000 | | | |
| | 25 | 0.78 | < 0.000 | 0.77 | < 0.000 | | | |
| | 26 | 0.71 | < 0.000 | 0.71 | < 0.000 | | | |
| | 27 | 0.41 | < 0.000 | - | - | | | |

*$\chi 2$: chi square  $\chi 2$/df: ratio of chi square to df  RMSEA: Root Mean Square Error of Approximation*

The standardized factor loadings of the initial model, shown in Table (2), revealed that all items on the scale have loaded significantly as proposed and were accepted, except items number 4,6,23, and 27 which loaded < .05.

As a result the BLOCC scale was modified and consisted as follows;

SMC involves a set of four challenges reflected through items 1,2,3 and 5.

TLCC involves a set of nine challenges reflected through items 7,8,9,10,11,12,13,14 and 15.

SIC involves a set of four challenges reflected through items 16,17,18, and 19.

TSCC involves a set of six challenges reflected through items 20, 21,22,24,25, and 26.

No evidence of skewness or kurtosis revealed, which means that the distribution was roughly symmetrical and not too flat or too peaked. Table (2) reflects results according to each item, while Table (3) Appendix (1) reflects scale results according to subscales.

**Table 2.** Descriptive statistics for the BLOCC scale items

| *Subscales* | | *Items* | *Mean* | *SD* | *Skewness* | *Kurtosis* |
|---|---|---|---|---|---|---|
| *SMC* | *1* | I usually procrastinate doing my homework | 2.73 | 1.12 | 0.34 | -0.56 |
| | *2* | It is hard to get help online | 2.71 | 1.25 | 0.14 | -1.00 |
| | *3* | I lack the skill of organizing/prioritizing my chores and homework | 2.44 | 1.17 | 0.49 | -0.65 |
| | *5* | I do not have self-managerial skills | 2.27 | 1.13 | 0.62 | -0.36 |
| *TLCC* | *7* | It is hard to use the Moodle | 2.50 | 1.14 | 0.41 | -0.50 |
| | *8* | I prefer not to use technology | 1.98 | 1.10 | 1.04 | 0.38 |
| | *9* | I feel distracted when using technology in learning | 2.35 | 1.18 | 0.50 | -0.70 |
| | *10* | I find it hard to catch up with online schooling | 2.19 | 1.00 | 0.47 | -0.52 |
| | *11* | I am not good with using technology | 2.01 | 1.05 | 0.71 | -0.66 |
| | *12* | I do not know much about technology | 1.60 | 0.95 | 1.45 | 1.25 |
| | *13* | I feel intimidated to use technology due to my age | 1.48 | 0.83 | 1.66 | 1.80 |
| | *14* | I do not understand the need to use blended learning | 2.35 | 1.22 | 0.68 | -0.47 |
| | *15* | I am against using technology as a way to get my work done | 2.05 | 1.12 | 0.92 | 0.18 |
| *SIC* | *16* | I feel lonely when using blended learning | 2.12 | 1.17 | 0.64 | -0.68 |
| | *17* | The feeling of isolation decreases my interest in learning | 2.03 | 1.16 | 0.82 | -0.47 |
| | *18* | I face technical problems in setting up my devices for online learning | 2.33 | 1.19 | 0.48 | -0.73 |
| | *19* | I feel anxious when I am the center of attention in online discussion | 2.27 | 1.21 | 0.77 | -0.32 |
| *TSCC* | *20* | It is hard to get access to technology | 2.11 | 1.06 | 0.59 | -0.56 |
| | *21* | I do not feel that everyone is equal when it comes to access to technology | 2.94 | 1.14 | -0.06 | -0.74 |
| | *22* | I notice the lack of internet and updated computer devices | 2.41 | 1.16 | 0.52 | -0.49 |
| | *24* | I face technical difficulties when doing my homework electronically | 2.41 | 1.09 | 0.50 | -0.31 |
| | *25* | I feel distracted by the complexity of technology when doing blended learning homework | 2.38 | 1.11 | 0.52 | -0.29 |
| | *26* | I find technology to be complicated | 2.12 | 0.98 | 0.44 | -0.66 |

**Table 3.** Descriptive statistics for BLOCC scale subscales

| Subscales | Total score | Mean | Sd | RI (%) | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| SMC | 20 | 10.15 | 3.67 | 50.75 | 0.39 | -0.29 |
| TLCC | 45 | 18.51 | 6.65 | 41.13 | 0.77 | 0.18 |
| SIC | 20 | 8.75 | 3.48 | 43.75 | 0.64 | 0.20 |
| TSCC | 30 | 14.37 | 4.84 | 47.90 | 0.25 | -0.43 |

## Reliability

We checked for Item-Total Correlation, internal consistency, and composite reliability.

### Item-Total Correlation

Item-Total-Correlation was conducted to examine whether scale items measure the assigned aspects of the scale. The results revealed that each item was correlated with the summated challenges of the scale, values were acceptable and ranged between .55 and .72, see Table (4).

**Table 4.** Item- Total Correlation for the BLOCC scale

| Subscales | Items | Item- total correlation |
|---|---|---|
| SMC | 1 | .78 |
| | 2 | .77 |
| | 3 | .85 |
| | 5 | .73 |
| TLCC | 7 | .63 |
| | 8 | .71 |
| | 9 | .70 |
| | 10 | .77 |
| | 11 | .74 |
| | 12 | .70 |
| | 13 | .60 |
| | 15 | .67 |
| | 16 | .71 |
| SIC | 17 | .77 |
| | 18 | .79 |
| | 19 | .69 |
| | 20 | .70 |
| TSCC | 21 | .76 |
| | 22 | .67 |
| | 25 | .76 |
| | 26 | .79 |

### Internal Reliability

To check the internal consistency of the items within each factor. Cronbach alpha of each factor and the total score was calculated. All subscales were internally reliable with an alpha coefficient ranging between .73 and .86, which are considered high according to Taber, (2018), see Table (5).

### Composite Reliability

To prove that items of each factor are related, we calculated the composite reliability based on the coefficients of each item. Results revealed coefficient values were greater than 0.74. which indicated high level of composite reliability, see Table (5).

**Table 5.** Cronbach alpha and composite reliability (CR) of the BLOCC scale

| Subscale | Cronbach alpha | Composite reliability |
|---|---|---|
| SMC | 0.79 | 0.83 |
| TLCC | 0.86 | 0.95 |
| SIC | 0.73 | 0.74 |
| TSCC | 0.83 | 0.90 |

## Discriminant Validity

To evaluate the discriminant validity of the scale, we comparef the correlations between the four subscales. Each factor should reflect a different component of online challenges, subscales that should not be related will not be, or correlate with a minimum degree. We used Fornel and Larcker criterion to assess discriminant validity, we compared the square root of each AVE in the diagonal with the correlation coefficients (off-diagonal) for each subscale in the relevant rows and columns, Table (6) supports the discriminant validity between the subscales of the BLOCC scale.

**Table 6.** Discriminant validity between the BLOCC subscales

| Subscale | SMC | TLCC | SIC | TSCC |
|---|---|---|---|---|
| SMC | .71* | | | |
| TLCC | .66 | .71* | | |
| SIC | .53 | .56 | .64* | |
| TSCC | .57 | .70 | .62 | .68* |

*Square root of the Average Variance Extracted (AVE) (in bold, diagonal), Correlations coefficient between constructs (off-diagonal).*

To fulfil the third objective of this study regarding blended learners' online component challenges (dependent variables) according to different socio-demographic variables (independent variables), descriptive data, t-tests and One-way analysis of variance (ANOVA) were provided.

Descriptive statistics for the BLOCC scale items and subscales are shown in Table (2) and Table (3) included M, SD, and relative importance index (RI). The RI percentages indicated that SMC (50.75%) was the greatest challenge, followed by the TSCC (47.90), then SIC (43.75%) while the least challenge was the TLCC (41.13%).

An independent-sample t-test was conducted to study the difference according to (1) gender, (2) internet accessibility, (3) previous experience in BL courses, (4) job status, (5) marital status, (6) student's nationality (7) province. While (ANOVA) was conducted to compare the effectiveness of (8) age, (9) total income per month, (10) literacy in computer skills, (11) academic year, results were presented as follows;

### Gender

By comparing blended learning online component challenges between male and female participants, results revealed significant difference. On the BLOCC scale, male students were found to report higher levels of SMC ($t$ (262)= 2.81, $p$= .005), TLCC ($t$ (262) =4.04, $p$= .00), SIC ($t$ (262) =2.64, $p$ = .009), and TSCC ($t$ (262) = 2.59, $p$ =.01) compared to their female peers, see Table (7).

**Table 7.** Means, Standard Deviation and t test analysis for the BLOCC subscales according to gender

| Subscales | Males (n= 131) | | Females (n=132) | | t | sig |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| SMC | 10.78 | 3.61 | 9.52 | 3.63 | 2.81 | 0.005 |
| TLCC | 20.12 | 6.97 | 16.90 | 5.92 | 4.04 | 0.000 |
| SIC | 9.31 | 3.44 | 8.19 | 3.44 | 2.64 | 0.009 |
| TSCC | 15.14 | 4.89 | 13.61 | 4.69 | 2.59 | 0.010 |

*Note. *p<.05*

### Internet Accessibility

By comparing blended learning online component challenges according to internet accessibility, results revealed significant difference. On the BLOCC scale, students with no internet accessibility were found to report higher levels of SMC (t (262) = 2.42. p= .016), TLCC (t (262) =2.76, p= .006), SIC (t (262) =1.96, p = .05), and TSCC (t (262) = 2.1, p =.036) compared to their peers who have internet access, see Table (8).

**Table 8.** Means, Standard Deviation and t test analysis for the BLOCC subscales according to internet accessibility

| Subscales | No (n= 7) | | Yes (n= 256) | | t | sig |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| SMC | 13.43 | 3.05 | 10.06 | 3.65 | 2.42 | 0.016 |
| TLCC | 25.29 | 6.99 | 18.32 | 6.55 | 2.76 | 0.006 |
| SIC | 11.29 | 2.21 | 8.68 | 3.49 | 1.96 | 0.050 |
| TSCC | 18.14 | 2.04 | 14.27 | 4.86 | 2.10 | 0.036 |

*Note. *p<.05*

### Previous Experience in BL Courses

By comparing blended learning online component challenges according to previous experience in blended learning courses, results revealed significant difference. On the BLOCC scale, students with no internet accessibility were found to report higher levels of SMC (t (262) = 3.87. p= .000), TLCC (t (262) =4.66, p= .000), SIC (t (262) =2.46, p = .014), and TSCC (t (262) = 3.22, p =.001) compared to their peers who have no previous experience in blended learning courses, see Table (9).

**Table 9.** Means, Standard Deviation and t test results for the BLOCC subscales according to previous experience in BL courses

| Subscales | No (n= 127) | | Yes (n= 136) | | t | sig |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| SMC | 11.03 | 3.50 | 9.32 | 3.64 | 3.87 | 0.000 |
| TLCC | 20.41 | 6.79 | 16.73 | 6.02 | 4.66 | 0.000 |
| SIC | 9.29 | 3.36 | 8.24 | 3.53 | 2.46 | 0.014 |
| TSCC | 15.35 | 4.94 | 13.46 | 4.58 | 3.22 | 0.001 |

*Note. *p<.05*

Nevertheless, results revealed no significance differences for the blended learning online component challenges according to their job status, marital status, province, see Table (10-12).

**Table 10.** Means, Standard Deviation and t test results for the BLOCC subscales according to job status

| Subscales | Have a job (n= 92) | | Do not have a job (n= 171) | | T | sig |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| SMC | 10.20 | 3.76 | 10.12 | 3.63 | 0.15 | 0.787 |
| TLCC | 19.01 | 6.94 | 18.23 | 6.49 | 0.90 | 0.367 |
| SIC | 8.60 | 3.61 | 8.83 | 3.41 | 0.51 | 0.606 |
| TSCC | 14.57 | 4.72 | 14.26 | 4.92 | 0.48 | 0.630 |

*Note. *p<.05*

**Table 11.** Means, Standard Deviation and t test results for the BLOCC subscales according to marital status

| Subscales | Single (n= 251) | | Married (n= 12) | | t | sig |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| SMC | 10.19 | 3.74 | 9.33 | 1.30 | 0.78 | 0.432 |
| TLCC | 18.47 | 6.73 | 19.17 | 4.73 | 0.35 | 0.725 |
| SIC | 8.72 | 3.53 | 9.42 | 2.15 | 0.68 | 0.497 |
| TSCC | 14.23 | 4.89 | 17.33 | 2.19 | 2.18 | 0.300 |

*Note. *p<.05*

**Table 12.** Means, Standard Deviation and t test results for the BLOCC subscales according to province

| Subscales | Central territory (n= 231) | | North territory (n= 28) | | t | sig |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| SMC | 10.04 | 3.61 | 10.96 | 4.10 | 1.26 | 0.208 |
| TLCC | 18.31 | 6.63 | 19.46 | 7.05 | 0.86 | 0.389 |
| SIC | 8.70 | 3.37 | 8.54 | 3.86 | 0.24 | 0.809 |
| TSCC | 14.30 | 4.74 | 13.82 | 4.94 | 0.50 | 0.614 |

*Note. *p<.05*

*The south territory was excluded (n=4)*

### Age

Results related to age groups revealed significant difference in TLCC and TSCC; F (2,260) = 5.74, p=0.004 and F(2,260) = 3.28, p=0.039 respectively. Post hoc analyses using the Scheffé post hoc criterion for significance indicated that; TLCC was significantly higher in the age group 26-30 (M = 22.29, SD = 4.61) than in the other two age groups (< 20 and 21 – 25) (M = 19.05, SD = 6.91), (M = 16.81, SD = 5.99) respectively, F(2,260) = 5.74, p=0.004, and finally TSCC was significantly higher in the age group 26-30 (M=17.36, SD =3.05) than in the other two age groups (< 20 and 21 – 25) (M = 14.40, SD = 5.05), (M= 13.81, SD = 13.81) respectively, F(2,260) = 3.28, p =.039, see Table (13a-b).

**Table 13a.** Means, Standard Deviation and One-way ANOVA for the BLOCC subscales according to age

| Subscales | < 20 (n= 165) | | 21 – 25 (n= 84) | | 26 – 30 (n= 14) | | F (2,263) | sig | η2 |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | | | |
| SMC | 10.36 | 3.76 | 9.57 | 3.33 | 11.07 | 4.25 | 1.77 | 0.171 | 0.013 |
| TLCC | 19.05 | 6.91 | 16.81 | 5.99 | 22.29 | 4.61 | 5.74 | 0.004 * | 0.042 |
| SIC | 9.00 | 3.43 | 8.12 | 3.51 | 9.57 | 3.52 | 2.21 | 0.111 | 0.017 |
| TSCC | 14.40 | 5.05 | 13.81 | 4.51 | 17.36 | 3.05 | 3.28 | 0.039 * | 0.025 |

** indicate significant differences within the categories of the independent variable*

**Table 13b.** Scheffe post hoc test for the BLOCC significant subscales according to age

| Subscales | age | M | 21 - 25 | 26 - 30 |
|---|---|---|---|---|
| TLCC | < 20 | 19.05 | 0.040 | |
| | 21 - 25 | 16.81 | | |
| | 26 - 30 | 22.29 | 0.016 | |
| TSCC | < 20 | 14.40 | | |
| | 21 - 25 | 13.81 | | |
| | 26 - 30 | 17.36 | 0.039 | |

## Total Income per Month

Also, ANOVA results related to total income/ month reflected significant differences in TLCC and TSCC; $F(2,260) = 6.56$, $p=0.002$ and $F(2,260) = 3.96$, $p=0.020$ respectively. Post hoc analyses using the Scheffé post hoc criterion for significance indicated that; TLCC was significantly higher in the income/ month group < 500 JD (M = 20.93, SD = 6.53) than in the other two income/ month groups ( 500-1000 JD and >1000 JD) (M = 19.05, SD = 6.91), (M = 18.25, SD = 6.99) respectively, $F(2,260) = 6.56$, $p=0.002$, and finally TSCC was significantly higher in the income/ month group < 500 JD (M=15.83, SD =4.19) than in the other two groups (500-1000 JD and >1000 JD) (M = 14.15, SD = 5.00), (M= 13.36, SD = 4.75) respectively, $F(2,260) = 3.96$, $p=0.020$, see Table (14a-b).

**Table 14a.** Means, Standard Deviation and One-way ANOVA for the BLOCC subscales according to total income per month

| Subscales | < 500 JD (n=58) | | 500-1000 JD (n=155) | | >1000 JD (n=50) | | F (2,263) | sig | η2 |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | | | |
| SMC | 11.07 | 3.72 | 10.05 | 3.47 | 9.40 | 4.05 | 2.97 | 0.053 | 0.022 |
| TLCC | 20.93 | 6.53 | 18.25 | 6.99 | 16.48 | 4.65 | 6.56 | 0.002 | 0.048 |
| SIC | 9.36 | 3.36 | 8.52 | 3.58 | 8.76 | 3.29 | 1.24 | 0.288 | 0.010 |
| TSCC | 15.83 | 4.19 | 14.15 | 5.00 | 13.36 | 4.75 | 3.96 | 0.020 | 0.030 |

**Table 14b.** Scheffe post hoc test for the BLOCC significant subscales according to total income per month

| Subscales | Income level | M | 500 - 1000 | > 1000 jd |
|---|---|---|---|---|
| TLCC | < 500 jd | 20.93 | 0.029 | 0.002 |
| | 500 - 1000 | 18.25 | | |
| | > 1000 jd | 16.48 | | |
| TSCC | < 500 jd | 15.83 | | 0.030 |
| | 500 - 1000 | 14.15 | | |
| | > 1000 jd | 13.36 | | |

### Literacy in Computer Skills

Accordingly, ANOVA results related to literacy in computer skills level reflected significant differences in SMC, TLCC, and TSCC; F(2,260) = 10.79, p=0.000, F(2,260) = 22.80, p=0.000, and F(2,260) = 12.03, p=0.000 respectively. Post hoc analyses using the Scheffé post hoc criterion for significance indicated that; SMC was significantly higher in the Computer literacy group Fair computer literacy (M = 11.04, SD = 3.45) than in the other two Computer literacy groups ( Good and Excellent) (M = 9.33, SD = 3.71), (M = 8..41, SD = 3.44) respectively F(2,260) = 10.79, p=0.000. TLCC was significantly higher in the Computer literacy group Fair computer literacy (M = 20.82, SD = 6.75) than in the other two Computer literacy groups (Good and Excellent) (M = 16.15, SD = 5.63), (M = 14.66, SD = 4.49) respectively F(2,260) = 22.80, p=0.000, and finally TSCC was significantly higher in the Computer literacy group Fair (M=15.65, SD =4.75) than in the other two groups (Good and Excellent) (M = 12.98, SD = 4.19), (M= 12.47, SD = 5.38) respectively, F(2,260) = 12.03, p=0.000, see Table (15a-b).

**Table 15a.** Means, Standard Deviation and One-way ANOVA for the BLOCC subscales according to literacy in computer skills level

| Subscales | Fair (n= 143) | | Good (n= 88) | | Excellent (n= 32) | | F (2,263) | sig | η2 |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | | | |
| SMC | 11.04 | 3.45 | 9.33 | 3.71 | 8.41 | 3.44 | 10.79 | 0.000 | 0.077 |
| TLCC | 20.82 | 6.75 | 16.15 | 5.63 | 14.66 | 4.49 | 22.80 | 0.000 | 0.149 |
| SIC | 9.01 | 3.43 | 8.33 | 3.47 | 8.75 | 3.73 | 1.03 | 0.358 | 0.008 |
| TSCC | 15.65 | 4.75 | 12.98 | 4.19 | 12.47 | 5.38 | 12.03 | 0.000 | 0.085 |

**Table 15b.** Scheffe post hoc test for the BLOCC significant subscales according to literacy in computer skills level

| Subscales | Computer skills level | M | Good | Excellent |
|---|---|---|---|---|
| SMC | Fair | 11.04 | 0.002 | 0.001 |
| | Good | 9.33 | | |
| | Excellent | 8.41 | | |
| TLCC | Fair | 20.82 | 0.000 | 0.000 |
| | Good | 16.15 | | |
| | Excellent | 14.66 | | |
| TSCC | Fair | 15.65 | 0.000 | 0.003 |
| | Good | 12.98 | | |
| | Excellent | 12.47 | | |

No significant differences revealed according to academic year in all subscale components SMC, TLCC, SIC and TSCC as follows; $F(3,259) = 0.19$, $p=0.897$, $F(3,259) = 1.65$, $p=0.178$, $F(3,259) = 778$, $p=0.502$, and $F(3,259) = 43$, $p=0.728$, see Table (16).

**Table 16.** Means, Standard Deviation and One-way ANOVA for the BLOCC subscales according to academic year

| Subscales | First (n= 133) | | Second (n= 69) | | Third (n= 21) | | Fourth (n= 40) | | F (3, 262) | sig | η2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | M | SD | | | |
| SMC | 10.26 | 3.56 | 9.99 | 4.13 | 10.48 | 4.00 | 9.90 | 3.08 | 0.19 | 0.897 | 0.002 |
| TLCC | 19.19 | 6.89 | 18.10 | 6.82 | 19.05 | 6.47 | 16.65 | 5.31 | 1.65 | 0.178 | 0.019 |
| SIC | 8.76 | 3.53 | 8.75 | 3.49 | 9.67 | 4.08 | 8.23 | 2.97 | 0.778 | 0.502 | 0.009 |
| TSCC | 14.28 | 4.90 | 14.58 | 5.15 | 15.24 | 4.96 | 13.85 | 4.07 | 0.43 | 0.728 | 0.005 |

## DISCUSSIONS

Although the blended learning approach is popular, highly adopted, and beneficial in optimizing teaching and learning (Dziuban et al., 2018), the inclusion of technology creates online component level of unease to students. Students' self-management skills and technological competences are crucial to effectively manage and carry out their educational responsibilities independently of their instructors, and implementing online technology (Rasheed et al, 2020)

This study has focused on the online component of blended learning rather than addressing the design challenges as a whole, we validated and implemented the BLOCC scale, the results were in accordance with several studies which have reported challenges that students face in the online component of blended learning.

Based on our results, the validaty and reliability of the BLOCC scale were confirmed, the final version of the scale consisted of 23 items, distributed into the four proposed subscales; self-management challenges (SMS), technological literacy and competency challenges (TLCC), students' isolation challenges (SIC), and technological sufficiency and complexity challenges (TSCC). For further validation, we also checked the ability of the scale to identify differences between the sample of the study according to various sodio-demographic variables.

Hence, we will discuss the results of our study regarding the challenges and differences according to the previously mentioned four BLOCC subscales;

First, 'self-management challenges' (SMC; n=4) which involve behaviors that deter students from self-managing their thoughts, feelings and actions to achieve their learning goals.

Results of the study revealed that male students, students who have no internet accessibility, those who have no previous experience in blended learning classes, and students with lower literacy in computer skills level have encountered significant levels in SMC. This might be attributed to the fact that Blended learning offers students the freedom of learning at one's pace, flexibility and autonomy to organize and self-manage their learning activities. According to Chuang et al., (2018), Lightner & Lightner-Laws, (2016), Cakiroglu & Ozturk, (2017) students exibit 'self-regulation' as a challenge, they have poor self-management skills to organize and manage their learning tasks independently, and they relatively spend small portion of their time in learning tasks. Basically, they find it difficult to organize and prioritize their chores and homework, they feel they lack managerial skills.

Procrastination is also one form of self-management, students procrastinate doing their homework (Broadbent, 2017; Sun, Wu, & Lee, 2017; AlJarrah et al., 2018; Maycock et al., 2018). It is considered a psychological dysfunction and a harmful behavior present in online learning settings, where students experience a larger sense of transactional distance (Boelens et al., 2017; Van Eerde & Klingsieck, 2018). Davis & Abbitt, (2013) claimed that the use of mobile application (Moodle application) for smartphones reduced their procrastination level, and that mobile application is used as an intervention tool that alerts and stimuli students to illuminate procrastination.

Students tend to interact and connect with their colleagues through the online platform and through forums discussions (Rasheed et al., 2020). Yet, Chen et al., (2015), Broadbent, (2017), and Akcayir & Akcayir, (2018) reported that students encountered difficulties connecting with their peers and getting appropriate online help. Safford & Stinton, (2016) stated that students feel intimidated by seeking online help, which might lead to searching unreliable sources (Broadbent, 2017).

Secondly, 'technological literacy and competency challenges' (TLCC; n=9) which involve students' proficiency and competency that effect their use of technology for studying. Results of this study revealed that male students, students who have no internet accessibility, those who have no previous experience in blended learning classes, older students (26-30 years old), those with the lowest total income/ month (< 500 JD) and students with lower literacy in computer skills level encountered significant levels in TLCC. Although computer skills are essential for blended learning process, the sample of this study declared that they did not know much about technology and were not good with at it. and prefered not to. They felt distract when using technology in learning and did not know how to use the platform "Moodle", in addition to dealing with different technological user interfaces (Prasad et al., 2018). They found it hard to catch up with online classes, some students did not understand the need to use blended learning, and felt intimidated to use technology due to their age. Akcayir & Akcayir, (2018), on the other hand, argued that students of this generation are assumed to have less difficulties in using technology than the former generations, some were even against the use of technology to get my work done. These results are in accordance with Zacharis (2015) who emphasized the effect of students' technological illiteracy on the delay of interacting with their instructors and peers, leading to definite procrastination and setbacks in their performance. Thus, it is important to emphasize the fact that both technology literacy and competency are crucial for blended learning students.

Thirdly, 'students isolation challenges' (SIC; n=4), involve students' suffering from emotional discomfort due to seclusion and loneliness (Lightner & Lightner- Laws, 2016; Chyr et al., 2017). Results of this study revealed that Male students, students who have no internet accessibility, and those who have no previous experience in blended learning classes encountered significant levels in SIC. Students felt lonely when using blended learning, their feeling of isolation decreased their interest and motivation for learning, according to Rasheed (2020) this might result in challenges in activities of preparations and assignments. Students felt anxious when they were the center of attention during online discussions, whether the reason was video conferences or using the microphones (Bower, 2015; Szeto & Cheng, 2016). They also had technical problems in setting up their devices for online learning.

Fourthly, 'Technological sufficiency and complexity challenges' (TSCC; n=4) involve facing sufficient or complex online technologies and services challenges for their studies. Results of this study revealed that male students, students who have no internet accessibility, those who have no previous experience in blended learning classes, and Students with lower literacy in computer skills level encountered significant levels in TSCC. Students felt that it was hard for them to get access to technology, and not everyone is equal when it comes to access to technology (Chen et al., 2015; Akcayir & Akcayir, 2018). Some students lack access to internet such as; a high broadband Wi-Fi or updated computer devices (Rasheed, 2020). Also, students might have found technology to be complicated, or they might face technical difficulties when doing their homework electronically and feel distracted, their time and focus would be spend on learning how to use new technology rather than doing their homework (Safford & Stinton, 2016; Prasad et al., 2018).

## CONCLUSION

This study aims to provide the blended learning literature with detailed picture of the students' online component challenges from their own perspective. To do so, we validated the BLOCC scale, and implemented it to study the online component challenges according to different sample characteristics.

The BLOCC scale included four subscales: Self- Management Challenges (SMC), Technology Literacy and Competency Challenges (TLCC), Student Isolation Challenges (SIC), and Technological Sufficiency and Complexity Challenges (TSCC). BLOCC scale proved to be valid and reliable; The overall fit statistics for the hypothesized four factor model ($\chi 2$ (df = 2.69) = 603.47, $p < 0.001$, (RMSEA) = .08 indicated a moderate and acceptable fit to the data representing the latent factor structure. Four items were excluded.

Reliability was assessed; Item-to-total correlation (.55 and .72), Cronbach Alpha (.72 and .86), and composite reliability (.74 -.95). Also, the results of discriminant validity ranged between .53 and .70. expressing a good discriminate validity. Thus, the BLOCC scale adapted was suitable to study the online component challenges of blended learning, mainly these four subscales. Results of the study revealed that male students, students who have no internet accessibility, and those who have no previous experience in blended learning classes, all encountered significant levels in all subscales. Older students (26-30 years old), and those with the lowest total income/ month (< 500 JD) encountered significant levels of TLCC and TSCC. Students with lower literacy in computer skills level encountered significant differences in SMC, TLCC and TSCC. While no significant differences revealed according to their job status, marital status, student nationality, province, and academic year in all subscale components. A limitation of this scale is that it was suitable to be used in the BL classes at the School of Sport Sciences/ University of Jordan. However, future studies are encouraged for a different and much bigger sample to further validate the instrument. We encourage future studies to propose and implement curative approaches to face such online component challenges, such as a repetitive training and guiding process to learners, group awareness and peer assistance and carefully structure both the face-to-face and online components ( Lin et al., 2016; Rasheed, 2020). Also, stakeholders might benefit from the results of the learners' online component challenges for future planning.

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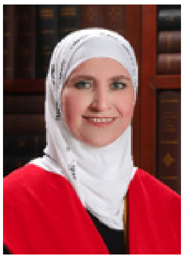

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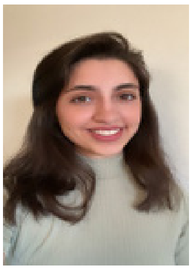

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## REFERENCES

Ab Hamid, M. R., Sami, W., & Sidek, M. M. (2017). Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT criterion. In Journal of Physics: Conference Series (Vol. 890, No. 1, p. 012163). IOP Publishing. https://doi.org/10.1088/1742-6596/890/1/012163

Akcayir, G., & Akcayir, M. (2018). The flipped classroom: A review of its advantages and challenges. Computers & Education, 126, 334–345. https://doi.org/10.1016/j.compedu.2018.07.021

AlJarrah, A., Thomas, M. K., & Shehab, M. (2018). Investigating temporal access in a flipped classroom: Procrastination persists. International Journal of Educational Technology in Higher Education, 15(1), 1. https://doi.org/10.1186/s41239-017-0083-9

Bailey, K. D., & Morais, D. B. (2005). Exploring the use of blended learning in tourism education. Journal of Teaching in Travel & Tourism, 4(4), 23-36. https://doi.org/10.1300/J172v04n04_02

Bayyat, M., Al Dabbas, L., & Abu Muili, Z. (2020). Development and Validation of the "Blended Learners' Online Component Challenges" Scale [Manuscript submitted for publication]

Boelens, R., De Wever, B., & Voet, M. (2017). Four key challenges to the design of blended learning: A systematic literature review. Educational Research Review, 22, 1-18. https://doi.org/10.1016/j.edurev.2017.06.001

Bonk, C. J., Olson, T. M., Wisher, R. A., & Orvis, K. L. (2002). Learning from focus groups: An examination of blended learning. International Journal of E-Learning & Distance Education, 17(3), 97-118.

Bourne, J., Harris, D., & Mayadas, F. (2005). Online engineering education: Learning anywhere, anytime. Journal of Engineering Education, 94, 131-146. https://doi.org/10.1002/j.2168-9830.2005.tb00834.x

Bower, M., & Sturman, D. (2015). What are the educational affordances of wearable technologies?. Computers & Education, 88, 343-353. https://doi.org/10.1016/j.compedu.2015.07.013

Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic performance. The Internet and Higher Education, 33, 24–32. https://doi.org/10.1016/j.iheduc.2017.01.004

Chen, L., Chen, T. L., & Chen, N. S. (2015). Students' perspectives of using cooperative learning in a flipped statistics classroom. Australasian Journal of Educational Technology, 31(6). https://doi.org/10.14742/ajet.1876

Chuang, H. H., Weng, C. Y., & Chen, C. H. (2018). Which students benefit most from a flipped classroom approach to language learning?. British Journal of Educational Technology, 49(1), 56-68. https://doi.org/10.1111/bjet.12530

Chyr, W.-L., Shen, P.-D., Chiang, Y.-C., Lin, J.-B., & Tsai, C.-W. (2017). Exploring the effects of online academic help-seeking and flipped learning on improving students' learning. Journal of Educational Technology & Society, 20(3), 11–23.

Dalsgaard, C., & Godsk, M. (2007). Transforming traditional lectures into problem-based blended learning: challenges and experiences. Open learning, 22(1), 29-42. https://doi.org/10.1080/02680510601100143

Dos, B. (2014). Developing and evaluating a blended learning course. The Anthropologist, 17(1), 121-128. https://doi.org/10.1080/09720073.2014.11891421

Dziuban, C., Graham, C. R., Moskal, P. D., Norberg, A., & Sicilia, N. (2018). Blended learning: The new normal and emerging technologies. International Journal of Educational Technology in Higher Education, 15(1), 3. https://doi.org/10.1186/s41239-017-0087-5.

Feng, S. (2018). Applied Research on College Sports Blended Learning Based on Moodle Platform. Educational Sciences: Theory & Practice, 18(5). https://doi.org/10.12738/estp.2018.5.010

Guzer, B., & Caner, H. (2014). The past, present and future of blended learning: an in depth analysis of literature. Procedia-social and behavioral sciences, 116, 4596-4603. https://doi.org/10.1016/j.sbspro.2014.01.992

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (1998). Multivariate data analysis (Vol. 5, No. 3, pp. 207-219). Upper Saddle River, NJ: Prentice hall.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indices in covariance structure analysis: Sensitivity under parameterized model misspecification. Structural Equation Modeling, 6(1), 1-55.

Hughes, G. (2007). Using blended learning to increase learner support and improve retention. Teaching in Higher Education, 12(3), 349-363. https://doi.org/10.1080/13562510701278690

Keogh, J. W., Gowthorp, L., & McLean, M. (2017). Perceptions of sport science students on the potential applications and limitations of blended learning in their education: a qualitative study. Sports biomechanics, 16(3), 297-312. https://doi.org/10.1080/14763141.2017.1305439

Le, Y. (2011). Application of computer and multimedia technology in college physical education. Circuits, Communications & System, 1-3. http://dx.doi.org/10.1109/PACCS.2011.5990343

Lin, J. W., Lai, Y. C., Lai, Y. C., & Chang, L. C. (2016). Fostering self-regulated learning in a blended environment using group awareness and peer assistance as external scaffolds. Journal of Computer Assisted Learning, 32(1), 77-93. https://doi.org/10.1111/jcal.12120

Lightner, C.A., & Lightner-Laws , C.A. (2016) A blended model: simultaneously teaching a quantitative course traditionally, online, and remotely, Interactive Learning Environments, 24:1, 224-238, DOI: 10.1080/10494820.2013.841262

Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. Structural equation modeling, 11(3), 320-341. https://doi.org/10.1207/s15328007sem1103_2

Maycock, K. W., Lambert, J., & Bane, D. (2018). Flipping learning not just content: A 4-year action research study investigating the appropriate level of flipped learning. Journal of Computer Assisted Learning, 34(6), 661-672. https://doi.org/10.1111/jcal.12274

Mitchell, P., & Forer, P. (2010). Blended learning: The perceptions of first-year geography students. Journal of Geography in Higher Education, 34(1), 77-89. https://doi.org/10.1080/03098260902982484

Napier, N. P., Dekhane, S., & Smith, S. (2011). Transitioning to blended learning: Understanding student and faculty perceptions. Journal of Asynchronous Learning Networks, 15(1), https://doi.org/20-32. 10.24059/olj.v15i1.188

Prasad, P. W. C., Maag, A., Redestowicz, M., & Hoe, L. S. (2018b). Unfamiliar technology: Reaction of international students to blended learning. Computers & Education, 122, 92–103. https://doi.org/10.1016/j.compedu.2018.03.016.

Pizzi, M. A. (2014). Blended learning pedagogy: the time is now!. Occupational therapy in health care, 28(3), 333-338. https://doi.org/10.3109/07380577.2014.908479

Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. Computers & Education, 144, 103701. https://doi.org/10.1016/j.compedu.2019.103701

Safford, K., & Stinton, J. (2016). Barriers to blended digital distance vocational learning for non-traditional students. British Journal of Educational Technology, 47(1), 135–150. https://doi.org/10.1111/bjet.12222

Stubbs, M., Martin, I., & Endlar, L. (2006). The structuration of blended learning: putting holistic design principles into practice. British Journal of Educational Technology, 37(2), 163–175. http://dx.doi.org/10.1111/j.1467-8535.2006.00530.x

Sun, J. C. Y., Wu, Y. T., & Lee, W. I. (2017). The effect of the flipped classroom approach to OpenCourseWare instruction on students' self-regulation. British Journal of Educational Technology, 48(3), 713-729. https://doi.org/10.1111/bjet.12444

Szeto, E., & Cheng, A. Y. (2016). Towards a framework of interactions in a blended synchronous learning environment: What effects are there on students' social presence experience? Interactive Learning Environments, 24(3), 487–503. https://doi.org/10.1080/10494820.2014.881391

Tay, H. Y. (2016). Investigating engagement in a blended learning course. Cogent Education, 3(1), 1135772. https://doi.org/10.1080/2331186X.2015.1135772

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education, 48(6), 1273-1296. DOI 10.1007/s11165-016-9602-2

Tamim, R. M. (2018). Blended Learning for Learner Empowerment: Voices from the Middle East. Journal of Research on Technology in Education, 50(1), 70-83. https://doi.org/10.1080/15391523.2017.1405757

Van Eerde, W., & Klingsieck, K. B. (2018). Overcoming procrastination? A meta-analysis of intervention studies. Educational Research Review, 25, 73-85. https://doi.org/10.1016/j.edurev.2018.09.002

Zacharis, N. Z. (2015). A multivariate approach to predicting student outcomes in web-enabled blended learning courses. The Internet and Higher Education, 27, 44–53. https://doi.org/10.1016/j.iheduc.2015.05.002

Zhou, Y., Zhou, Y., & Zhou, Y. (2017). Design of moodle-based podcast teaching platform for the course of aerobic gymnastics. International Journal of Emerging Technologies in Learning, 12(9), 95-104. http://dx.doi.org/10.3991/ijet.v12i09.7490

# CO-CREATION APPLIED TO INNOVATION FOR BRANDING ONLINE DISTANCE EDUCATION

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## ABSTRACT

This exploratory qualitative research investigates branding innovation for online distance education in Australian regional universities. The purpose is to apply co-creation to specify the type of innovation and branding approach for online distance education. The research purpose was achieved by studying two regional universities in Australia. The data was collected through in-depth interviews. Convenient sampling was employed to finalize the total sample of 36 managers, administration officials, technical staff and academics in both universities. Data analysis was conducted by thematic analysis. Research findings emphasized the importance of continuous innovation based on co-creation and cooperative branding for online distance education. Findings of this qualitative study were constructed on direct interviews conducted with internal stakeholders indicating three emerging themes: need for flexible education, growing market opportunities and the role of technological support. The paper argues that continuous innovation with cooperative branding will enhance academic and competitive performance of regional universities. Branding could be strategized by point-of-parity and cooperation replacing point-of-difference approach in the education industry. Research outcomes cover a gap in literature on branding online distance education for innovation based on co-creation. This study could be replicated in other countries including Turkey to investigate factors affecting innovation for branding distance education.

**Keywords:** Distance education, branding, online teaching, co-creation, continuous innovation.

## INTRODUCTION

Distance learning became the trend in the last century especially for people working and seeking flexible education to develop their careers and professions (Kara, Erdoğdu, Kokoc, & Cagiltay, 2019; Ozbek, 2015; Yuzer, 2014). Online education as an innovation emerged as a most viable channel for distance teaching and learning in this century (He, Xu & Kruck, 2019; da Silva, Barbosa & Gomes, 2019; Fagerstrom & Ghinea, 2013; Garrett, 2004). The distance learning based on online education also provided an opportunity to non-metropolitan or regional universities to compete with metropolitan or capital city universities on similar grounds of education quality and service delivery. Students opting for distance learning were not motivated by the size, reputation or location of the campus, but the quality of education and service embedded with their online classes and online assessments (Ozbek, 2015; Granitz & Greene, 2003).

The importance of online education has re-emerged recently during the Covid-19 pandemic. The global impact of Covid-19 showed a massive influence on education and the way it had been offered and delivered across the globe. Hence, transforming many educational institutions towards online distance learning. This global transformation towards adapting online distance education platforms changed the marketing competition mechanisms as well. Governments around the world have already been cautious about the emergence of online distance education (da Silva et al., 2019; Yuzer, 2014; Garrett, 2004). Therefore, new education policies have been discovered and applied to manage online distance education. In Australian Higher Education context, the Bradley Report delivered by Bradley, Noonan, Nugent and Scales (2008) is still recognized as the defining moment that stressed upon reforms to strategise research and education innovation. Australian regional universities have been following the report's recommendations by readjusting the online education services for their clients enabling them to sustain the current crisis from the Covid-19 pandemic.

The inherent weakness of socio-economics due to remoteness impedes the expansion of higher education in regional areas. The slim market base and health crisis impends the survival of regional universities. A key feature of regional universities is the physical distance from major population centres. Today's world is getting more virtually interconnected hence making online education a viable option. While regional universities in Australia organise highly skilled people to embrace online technological development, a clear vision is vital for them to embrace innovation in a dynamic IT (Information Technology) environment as a managerial challenge (Siemens, 2013).

This research is motivated to study innovation for branding distance education based on co-creation among providers, consumers and other stakeholders involved with universities. The research direction of the paper is entrenched in the concern for universities accepting continuous or radical innovation for effective implementation of online education. The purpose of this paper is to study how innovation for online education could be achieved by following the innovation model from Abernathy and Clark (1995)? The overarching research question is: with the purpose to enhance marketing competencies by co-creation, should regional universities adopt brand positioning for their online services based on challenging or cooperative marketing strategies? Specific elements could be derived from literature and used as indicators to co-create and use in conducting interviews with stakeholders of the two selected regional universities in Australia.

## LITERATURE REVIEW

### Distance Education Innovation

The innovation in services such as education always opens the debate towards the types of innovation to be selected and applied (Kara et al., 2019; Siemens, 2013; Gallouj & Weinstein, 1997; Afuah & Bahram, 1995). Radical innovation is known as discontinuous or disruptive innovation, likewise continuous innovation could be similar to non-radical or incremental innovation (Smith, Brand & Kinash, 2013; Walter, Garrison & Anderson, 2013; Corkindale & Belder, 2009). Walter, Garrison and Anderson (2013) argued that traditional universities need to follow market changes of higher education by incubating disruptive communication and learning technologies, which is possible by continuous innovation in education services.

This research uses the types of innovation with terms such as radical and continuous innovation. Radical innovation is classically defined as 'the creation of a totally new product, i.e., one defined in terms of characteristics unconnected with those of an old product' (Gallouj & Weinstein, p.11, 1997). As a comparison, continuous or incremental innovation is 'the addition of one or two new characteristics to a certain type of product, either by directly mobilising certain competences, or by adding new technical characteristics' (Gallouj & Weinstein, p.12, 1997). The preceding definitions provide a guideline to apprehend the basic topics and subjects analyzed and applied in this research.

The Henderson-Clark Model is respected in innovation management, which underlines that products are made from interconnected components. The knowledge can be divided as: knowledge on components and knowledge of connections known as architectural knowledge (Henderson & Clark, 1990). Henderson & Clark (1990) further clarify that if an innovation adds value to both components and architectural knowledge then it is continuous, if both are cluttered then innovation is radical. Since the Henderson-Clark Model refers to physical features and functions, it is more applicable to tangible products where services are not considered equal to products (Gilbert, 2005).

The Abernathy-Clark Model presents two types of knowledge, the technological and market knowledge (Abernathy & Clark, 1985). Abernathy and Clark (1985) further clarify that for continuous innovation the producer protects the technological and market competencies; while for radical innovation their producer does not protect any of the two since the technological and market knowledge is relevant to the education industry. The Abernathy-Clark Model was hence embraced in this paper to find the innovation that could be applied for brand positioning online distance education by regional universities in Australia. The benefits of co-creation for students and institutions presented in the conceptual model by Dollinger, Lodge and Coates (2018) will also be explored in this paper.

## Brand Positioning Online Distance Education

This century has witnessed most universities around the world adopting online teaching platforms to strengthen their distance learning products and services. Marketing and brand positioning has played a vital role in the success of online distance education (da Silva et al., 2019; Whisman, 2009; Garrett, 2004). Generally, marketers and researchers have agreed that universities need to apply competitive branding strategies for online distance education (Khanna, Jacob, & Yadav, 2014; Granitz & Greene, 2003). However, Garrett (2004) concluded from his study on British Universities that aggressive competitive strategies was one of the causes for the failure of the UK e-University. On the contrary, co-creation based branding strategies engaging social media and online communities are suggested to avoid confrontation and adopt cooperative marketing approach (Hajli et al., 2017). Whisman (2009) also presented internal branding as an inside-out approach for university branding based on university's engagement with stakeholders rather than traditional advertising campaigns based on symbols and themes. Likewise, cooperative branding based on co-creation among communities on social media are favourably influenced by brand loyalty and trust (da Silva et al., 2019; Kamboj, Sarmah, Gupta & Dwivedi, 2018; Rinaldi & Cavicchi, 2016).

Branding is known as a process that creates a strategic identity to pass the information to a specified audience (Suomi & Jarvinen, 2013; Hajli, Shanmugam, Papagiannidis, Zahay, & Richard, 2017; Keller, 2003). A brand is known as a winner if the organisation behind the brand can recognize needs and wants of its target public (Keller, 2003). Most brand experts view brand as the essential asset as being the 'good will' (Aaker, 2007, p.9). Branding strategy is based on two major options, points of parity (POP) or cooperation, and points of difference (POD) or differentiation (Keller, 2003). This research appreciates brand positioning as the effort companies and universities execute to make their brand known. Keller and Lehmann (2006) presented a framework to integrate the customer-market and product-market, which was applied in this study to follow the trend in education industry and present recommendations for brand positioning online distance education. Likewise, Bowden (2011) stressed on functional and academic interactions for students as part of his relationship marketing strategy based on engaging students as customers.

## Branding Led by Co-creation

Researchers have been emphasising that branding strategies need to be mapped with co-creation strategy that is developed by using social media and online brand communities with cooperative and relationship marketing (Kamboj et al., 2018; Hajli et al., 2017; Rinaldi & Cavicchi, 2016). Galvano and Dalli (2014) categorised co-creation literature under three theoretical viewpoints: service science, innovation and technology management; and marketing and consumer research. The research conducted in this paper follows the third viewpoint of marketing and consumer research. The presence of the value co-creation experience is being observed in several industries between Business-to-Consumer (B2C), (C2B) and C2C (Ranjan & Read, 2016; Galvano & Dalli, 2014).

Prahalad and Ramaswamy (2013) emphasized on the co-creation experience as a ground value and as the future of innovation to be a winner in the upcoming influential experience economy that includes education. The experience of an individual with co-creation provides value resulting from the engagement of an individual at a given place and time and within the context of a special activity or experience. The co-creation depends not only on outsourcing or as the minimum adaptation of goods or products, but it demonstrates the process through which customers interact with the company and generate their own experience with the service provided (Fagerstrom & Ghinea, 2013; Prahalad & Ramaswamy, 2013). Kamboj et al. (2018) also advocated that branding strategies based on co-creation not only make the brand powerful, but also increases the brand loyalty from customers. Furthermore, it can be stated that co-creation and engagement with students combine students' abilities with institutional capabilities to simplify various educational processes leading towards more effective performance and innovation (Prahalad & Ramaswamy, 2013; Bowden, 2011).

Dollinger, Lodge and Coates (2018) explained that value co-creation depends on co-production of value and value-in-use, where co-creation enables institutions and students to collaborate for enhancing the study experience and students' capability to perform as partners. Similarly, Ranjan and Read (2016) elaborated that value co-creation is structured on double dimensions of the co-production of value: the value proposition is initiated together with customers, and, value-in-use: where value is outside the production process embedded in the consumption of the value. Value co-creation in education adjusts the marketing strategy based on consumer preferences and student behaviour (Elsharnouby, 2015; Fagerstrom & Ghinea, 2013; Prahalad & Ramaswamy, 2013). This paper adapts the first dimension of value co-creation as in the co-production of value in order to present suggestions for branding online education by universities.

### Online Education in Regional Universities

Similar to the global education industry, all Australian Universities are contending in today's arena of online teaching (Bradley et al., 2008). The regional and remote universities take online distance education as a tool to restructure their own markets aiming to achieve sustainability to match with other competitive establishments. Due to the educational reforms, regional universities found the opportunity to enter the competition for online education. The regional institutions were traditionally focusing on educating regional students and some international students, generally especially those who were pursuing discounted fees or plus points to secure Australian residence from immigration.

The emergence of online learning in distance education transformed the university education market by placing all universities in the same battle field (Elsharnouby, 2015; Ozbek, 2015). This revolution has also opened a new aspect of online marketing strategies heavily relying upon online branding (Bock, Poole, & Joseph, 2014). The celebrated universities use their reputation to brand and market their online education. Meanwhile, regional universities are facing this task to craft their own brand positioning for the new market where the competition is not confined to geographic positions. Dollinger et al. (2018) illustrated the conceptual model for co-creation in higher education signifying the collaboration among university students and the institution. The model elaborates upon the co-creation benefits for students such as: quality interaction, satisfaction and graduate capabilities. Meanwhile, the institution benefits from students' loyalty, image and student-university identification. Contrarily, research has been conducted on using co-creation for student recruitment in various universities (Fagerstrom & Ghinea, 2013).

The application of value co-creation within both dimensions of co-production of value and value-in-use has been presented in literature as discussed above. However, there is a gap in literature on discussing co-production based on value co-creation for branding online education for universities in general, and remote universities in particular. Therefore, Abernathy-Clark Model of innovation was adopted along with the conceptual model of co-creation in higher education presented by Dollinger et al. (2018). Since this study focuses on branding for institutions, the benefits of co-creation for institutions as mentioned above, will be further explored in this qualitative research based on interviews with stakeholders of the selected universities in Australia.

## METHODOLOGY

Due to the exploratory nature of this research, a qualitative methodology was considered appropriate to reach realistic findings based on interviews with selected stakeholders of two regional universities. In order to enhance the reliability processes in data collection and analyses, the author had to be realistic with data analysis (Lincoln & Guba (2003). Direct interviews were used to collect data and each interview transcript was analysed separately by the author to validate the findings (Alam, 2005; Miles & Huberman, 1994). The author appreciated guidelines from Lincoln & Guba (2003) that the existence of an objective reality is imperfectly perceived due to various limitations, hence various perspectives and opinions from stakeholders were independently recognised to enhance the impartiality and quality of the research outcomes.

This research investigated innovation for brand positioning online teaching in two regional institutes in Australia. Four respondent groups in both universities were recognized: managers, administration staff, IT experts and academics. This sampling was inspired by the sampling process adopted from the research of He et al. (2019) and Kara et al. (2019) selecting distance education stakeholders for their study. Furthermore, university employees were selected as respondents for this study since literature on branding and innovation has recommended them to be engaged in a university's branding process (Suomi & Jarvinen, 2013;

Corkindale & Belder, 2009; Curtis, Abratt & Minor, 2009; Abernathy and Clark, 1995). The significance of the staff members in brand positioning has been appreciated by labelling them as the 'brand champions' (Whisman, 2009, p.368). Since there was no pertinent theory available, ideas had to be inducted and hence an exploratory approach was followed and the data was analysed by adopting thematic analysis (Stake, 2013; Alam, 2005). Therefore, a qualitative methodology was adopted for effective findings and credible results.

## Case Selection

In Australia, two regional universities were selected for this study, they are further described ahead. University-A is considered as the biggest institute in the territory stretched out to five campuses in isolated areas. The University was established in 2003 and being young it offers new methods for teaching and learning with wide scope for research and knowledge development. Backed by a strong history of delivering value through vocational education as well as higher education, research and social engagement, University-A is expecting reasonable growth. The university seeks to be globally appreciated as a centre for excellence in indigenous and cross-cultural knowledge, tropical knowledge and desert knowledge.

University-B is the other and reasonably new Australian University with well spread operations across Australia, starting as a College of Advanced Education and becoming a University in 1992. The university is stretched to many campuses in its regional impression and in major Australian cities, which are being managed by a wholly owned subsidiary focusing on international students. University-B is considered to be the pioneer to provide flexible distance education, mixed-mode study, eliminating differences between full-time and part-time and on-campus and off-campus study.

## Direct Interviews

The sampling criteria followed for this study were precise and the identity of respondents was known to the author, so judgmental and convenience sampling were utilized (Stake, 2013; Browne, 2005). This study did not pursue the quantity of data but sought the quality of the information. The right number of respondents or sample size was decided by the principle of saturation indicating when data collected from interviews stretches to saturation where a comprehensive picture of diverse experiences related to the research is drawn (Alam, 2005; Gibbs, Kealy, Green, Welch, and Daly, 2007).

For direct interviews, 43 stakeholders confirmed to meet and share their thoughts. Eventually, 36 interviews were conducted where the information saturation, or the qualitative isomorph was attained (Ponterotto, 2005; Lincoln & Guba, 2003; Yin, 2011; Miles & Huberman, 1994). The final sample for this study consisted of eight IT staff members, seven managers, eleven administration staff members and ten academics at both regional universities.

In order to collect data for this qualitative research, following questions were asked from each participant during in-depth interviews:

- Q1. Please describe the product offered by your university? In your view, is online distance education a new product or an extension?
- Q2. In your view, is there an innovation for brand positioning the online distance education for your university?
- Q3. Do you suggest brand positioning of your online distance education based on competitive or cooperative strategies?
- Q4. Please illustrate if you are provided an opportunity to communicate your feedback regarding the marketing and branding of online distance education of your university? In your view, how this feedback could be used, or is being used, in the co-creation process?

The in-depth interviews in University-A were tape recorded and notes were written by the author as well. At the end of each interview, findings were validated by triangulating hand-written notes with interview recordings. All statements from each respondent were confirmed by asking them individually to check the transcript handed after completion of the interview. The author also travelled to two different campuses of University-B for interviews and consolidated written notes after each interview. All interview transcripts were finalized after triangulating hand-written notes and audio recordings.

## Data Analysis

All respondents were questioned during interviews based on the research questions given earlier. Generally, interviews ranged from 25 to 60 minutes, during the discussion author confirmed the key statement on the spot to make sure that the exact wordings were recorded. Each transcript was read repeatedly for thematic analysis to search thoughts of interviewees associated with the research's subject (McVea, Miller, Creswell, McEntarrfer and Coleman, 2009; Stepchenkova, Kirilenko and Morrison, 2009).

As a basic requirement for qualitative data analysis, the data collected from various sources was coded (Ponterotto, 2005). Codes have been explained as 'tags or labels for assigning units of meaning to the descriptive or inferential information compiled during study' (Miles & Huberman, 1994 p. 56). Coding is guided by research questions and directs the researcher towards new questions to arrive at research objectives, codes can be applied to words, phrases, sentences, or a paragraph (McVea et al., 2009; Alam, 2005). The completion of primary interviews and preparation of transcripts triggered the open coding process that was supported by the question-answer approach (Stepchenkova et al., 2009; Miles & Huberman, 1994).

In the open coding process, individual interview transcript was considered while looking for patterns of meanings, including assumptions or verdicts given by interviewees. The open coding itemized and delivered colour coded pointers emerging from interviews. Inspection of all colour coded indicators led to the arrival of clear thematic labels. These labels were then linked to the related colour coded sections to which they applied in each transcript. The open coding thematic labels were drawn from the repeated and underlined ideas of each respondent and were pasted on original transcripts. Eventually, axial coding specified any relationships between codes identified during the open coding process when codes were considered more valuable compared to the data (McVea et al., 2009; Gibbs et al., 2007).

In the axial coding process, codes were considered as tags or memos written during the open coding stage (Ponterotto, 2005). The codes were scrutinized and matched to apprehend combined answers and reactions from respondents leading to a cross-case analysis established on the collected data to impartially search themes and sub-themes within coded themes. Following the exploratory research protocols, no responses were forced to be seen as part of any themes or sub-themes. The researcher did not work out origins of any theme and sub-theme before the data collection or from the literature.

All responses belonging to an institute regarding a particular question were typed and placed in a single file. Therefore, total four files, one for each question, were prepared for each university that appeared as distinct essays. In the axial coding process, the cross-transcript analysis of each of the four questions was deliberated to conclude the research themes and sub-themes. The coding for each respondent in both universities is explained below:

**Table 1.** Codes for Respondents in University A and B

| University | Managers | Officials | IT Staff | Lecturers |
|---|---|---|---|---|
| University A | MA1, MA2… | OA1, OA2… | ITA1, ITA2… | LA1, LA2… |
| University B | MB1, MB2… | OB1, OB2… | ITB1, ITB2… | LB1, LB2… |

## FINDINGS

The thematic analysis conducted in this paper presented three major themes: flexible delivery of online distance education, opportunities leading to market growth and quality of IT performance. The subsequent discussion highlights the creation of the three major themes separately built on sub-themes emerging directly from conversations with participants. The flexible delivery as the first theme, given in Table 2, was accepted by assimilating three sub-themes: part-time job requirements, obligations towards the family and the remote location of the place.

It was observed that around 65% of enrolled students in both regional universities were managing fulltime work, home matters and part time studies. For example, it was found that more than half female students in University-A had children and were around the age of 31. Since their kids were school going to so they could manage their time to study in a university. Furthermore, challenges from unknown and unaccredited institutions offering good value packages also drove students towards flexible education from well-known institutes. Likewise, being remotely located and away from major cities were also observed recurrently as sub-themes improving the case for flexible education as a central theme.

**Table 2.** Flexible delivery of education themes and sub-themes

| Direct Quotes from respondents | Emerging Sub-Theme | Emerging Theme |
|---|---|---|
| Due to my causal work I was bounded to search for casual studies (OA2) | **Casual work** | |
| Most of my external students choose online studies due to work flexibility (LB1) | | |
| I plan to study in future and go for flexible online programs where I can manage a part-time job (ITB1) | | |
| While living in regional areas we have family commitments and can't organize fulltime studies (MB1) | **Family Commitments** | **Need for flexible education** |
| Me as a single mum, busy with kids and working, can only manage an online uni degree (LA1) | | |
| Most of my students opt for online studies due to the remote locations (LB2) | **Remoteness** | |
| My own uni job in IT hangs on remote distances, pushing students to go for online education (ITB2) | | |

The second theme appreciated in this study was the opportunity leading to the market growth of online distance education. As mentioned by participants, while considering the environment, crowd, pollution, security and health in larger cities, many students choose smaller regional universities to study in a quiet, safe and healthy atmosphere. Likewise, the author was informed that the tough competition between major universities also profited regional universities as some students did not want to be the victim of cross university competition and preferred an institute of teaching and not commercial competition. The interviews also disclosed that complicated admission procedures and most metropolitan universities shifting costs to students for online distance education also attracted students towards regional universities.

**Table 3.** Market growth and opportunity themes and sub-themes

| Direct Quotes from respondents | Emerging Sub-Theme | Emerging Theme |
|---|---|---|
| Most of my students find big cities too crowded to focus on their studies (LA2) | **Problems to study in big cities** | |
| Working and studying simultaneously in metro-cities is impossible for me (OA2) | | |
| I think most students hate heavy traffic in large cities (MB1) | | |
| Crazy competition in large cities damages the quality of uni education (MB1) | **Cost transfer issues for universities in large cities** | |
| I can't study and work in a metro city too far away from here (OA1) | | **Market Growth and Opportunity** |
| Universities in smaller areas receive more support from government compared to money making unis in capital cities (OB1) | | |
| Many international students can't compete to get admission in big universities (LB3) | **Admission issues in big universities** | |
| The admission process is complicated in big universities and only city kids find it easier to enter them(MB4) | | |
| Reputed universities treat students as money bags and do not care about admission opportunities for small town kids (LA3) | | |

The last theme emerging from interviews referred to the quality of IT (Information Technology) functions, processes and the people related to the online distance education. The effectiveness of the IT functions and people technically supporting online distance education with instant problem solving were frequently described to be essential. Furthermore, the ownership control of the lecturer and IT people was expressed by interviewees, mostly lecturers, as imperative for successful delivery of online distance education.

**Table 4.** IT Functionality themes and sub-themes

| Direct Quotes from respondents | Emerging Sub-Theme | Emerging Theme |
|---|---|---|
| Our job is to manage and solve any issues with IT side of business that 24/7 (ITA2) | **IT problem solving** | |
| Without the IT guys our daily problems in online teaching could be suicidal (with a smile) (LA4) | | |
| I think most students would give up online studying without diligent support from IT staff (MB4) | | |
| It is impossible for online education to survive without IT support (LB1) | **Regular Technical Support** | |
| No efficient technical support means no online business for our university (MB1) | | **IT functionality and performance** |
| I think good technical support in regional universities make us competitive against unis in capital cities (MB5) | | |
| The online education needs to be fully controlled by academics with due support from IT Department (LB3) | **IT Control** | |
| The IT staff must control the quality of online education delivery (ITA1) | | |
| IT members need to be part of strategic decisions by regional universities to deliver better and competitive quality services (ITB3) | | |

## Cooperative Branding for Online Distance Education

The qualitative data analysis delivered four sub-themes emphasizing upon the importance of POP and cooperative marketing for brand positioning for distance education delivered online. The innovation offered via online education is constructed upon technological platform that is a solution for the modern generation seeking new channels for education. Likewise, digital application and technology management keep universities at similar levels to offer online education. The socio-economic background of all domestic and foreign students was depicted as alike, therefore matching marketing and promotion strategies were deliberated and applied by universities targeting similar segments.

Consequently, it can be discussed that this study signifies the credibility of POP or cooperative branding in the education industry as illustrated in Table 5. The cooperative branding or POP was also reinforced due to the equal level and quality of staff members involved in online teaching. Generally participants came from academic background and expressed the trend of Australian Universities outsourcing study materials for online education to popular universities. Due to the open access of materials and technology, respondents conveyed that universities seemed to compete more effectively on equal grounds in online education market by pursuing cooperative branding or POP.

**Table 5.** Cooperative Branding for Distance Education

Themes and sub-themes

| Direct Quotes from respondents | Emerging Sub-Theme | Emerging Theme |
|---|---|---|
| All unis offering online education use similar techno standards (ITA2).<br>I think all Aussie unis use Moodle or Blackboard only (LA2). | **Similar Technology** | |
| For online education all unis use similar advertising tactics (MB1).<br>I feel that only one marketing firm is hired by all Aussie unis to promote their online education (LB2). | **Similar marketing and promotion strategies** | |
| The level and quality of academic staff delivering online education is similar in all Aussie unis (MB4).<br>A similar qualification gets you a job of a lecturer or an IT expert in any uni in Australia (MA1). | **Similar staff quality and levels** | **Cooperative Branding (POP)** |
| If big unis produce good online material then regional unis get in outsourced from other unis (LB2).<br>Study material for online education in all unis is quite similar (LA3). | **Similar study material by outsourcing** | |

## DISCUSSION AND CONCLUSION

Tables 2 to 4 highlight how participants in this study presented their thoughts on branding online education with reference to the themes related to POP or cooperative branding. The previous discussion on vital elements of branding online education and examination of interviews direct this paper towards the fundamental strategic results as the POP being centre for brand positioning strategies for online teaching.

The research recognized three major dimensions to be contemplated for brand positioning of online education, specified as: flexible delivery, market opportunity and growth, and the role of IT staff. The POP or cooperative strategy related to brand positioning of online distance education is linked to comparisons in the technology, students' socio-economic circumstances, cooperative marketing techniques, staff quality and outsourcing of the study related products. The cooperative marketing suggested from this research agrees with the insights from Bodwen (2011), referred by him as relationship marketing. The POD or challenging strategy related to brand positioning of online distance education is linked to differentiation with respect to the age and image of the university; brand equity related to the academic staff; student services and post study employment opportunities; outsourcing of the content and managing internal customers.

### Theoretical Implications

This research contributes to the literature on distance education and brand marketing linked with innovation. The concept of co-creation is uniquely used to gather information from various stakeholders to improve online distance education. The research presented three major dimensions to be contemplated for brand positioning of online education, specified as: flexible delivery, market opportunity and growth, and the role of IT staff. The classical innovation model from Abernathy and Clark (1985) was adopted in this research, which adds on the theory of innovation that for continuous innovation in online education, universities can strengthen their technological and market competencies. The continuous innovation is possible by co-creating among university students, faculty and administration; if cooperation branding is adapted as concluded by Bowden (2011).

This paper adds on to the knowledge on co-creation for higher education and supplements the benefits of co-creation. In this study, the advantages of quality interaction and satisfaction for students from co-creation outlined by Dollinger et al. (2018) are confirmed by interviews with university stakeholders who work closely with students. Likewise, universities benefiting by improving their students' loyalty and teaching quality image as suggested by Dollinger et al. (2018); is also supplemented in this research. Further insights are offered for the theory on branding online education adopting the cooperative branding rather than differentiated branding is recommended, based on exploring the dimension of value co-creation as in the co-production of value explained by Ranjan and Read (2016).

## Practical Implications

Since universities are investing in technological innovations for more effective online distance education, this paper recommends that regional universities need to innovate through online channels for distance teaching based on the co-creation approach. Brand positioning of online education is recommended to be linked to POP or cooperative rather than POD or challenging strategies within the Australian education industry, as suggested by Bodwen (2011). Since the universities located in remote areas need to offer parity in their education services by online teaching, any efforts to differentiate or claim supremacy will damage their marketing. Online distance education needs to be considered as an extension of the education product rather than a contest for the conventional education approach. This will support the marketing of online education and improve the loyalty of students and teaching quality image of universities, as advocated by Dollinger et al. (2018). Furthermore, the well-recognised notion from Whisman (2009) that universities need inside-out approach to brand development was further established in this study.

The two specific regional universities in Australia that were examined in this research are strengthening their competitiveness and have experienced rise in student numbers. A major factor accredited for this growth emerged during interviews is the inclination of online delivery of courses as distance education and external issues including unemployment due to the economic downturn and current Covid-19 pandemic. The suggestion of cooperative branding strategies for regional universities offering online education can be mirrored for regional and non-metropolitan universities in other countries.

## Future Research

As mentioned earlier, this research on online distance education has been accomplished in Australia, however, it can be applied in a global context. Future research ideas provide motivation for a similar qualitative study on online distance education to be conducted in Turkish Regional Universities. A natural future research is to confirm the reliability and validity of conclusions from this qualitative study. Findings of this research could be further quantified to improve the impact and future extensions. The quantification of findings of this qualitative study is essential for effective implication of the outcomes.

Furthermore, to strategise brand positioning effectively, the perspective of online consumers of distance learning, the students, is also vital. Hence, a future research on related topics is suggested to involve university students to understand their tastes and preferences regarding brand positioning for online distance education.

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## REFERENCES


Aaker, D. A. (2007). Innovation: brand it or lose it. *California Management Review,* 20 (1), 8-24.

Abernathy, W. J. and Clark, K. B. (1985). Innovation: Mapping the winds of creative destruction. *Research Policy*, 14 (1), 3-22.

Afuah, A. N. and Bahram, N. (1995). The hypercube of innovation. *Research Policy*, 24 (1), 51-57.

Alam, I. (2005). Fieldwork and data collection in qualitative marketing research. *Qualitative Market Research: An International Journal,* 8 (1), 97-112.

Bock, D. E., Poole, S. M., & Joseph, M. (2014). Does branding impact student recruitment: A critical evaluation. *Journal of Marketing for Higher Education*, 24(1), 11–21.

Bowden, J. L. H. (2011). Engaging the student as a customer: A relationship marketing approach. *Marketing Education Review*, 21(3), 211–228.

Bradley, D., Noonan, P., Nugent, H., & Scales, B. (2008). *Review of Australian higher education*: final report [Bradley Review]. Canberra: *Australian Government DEEWR*.

Browne, K. (2005). Snowball sampling: using social networks to research non-heterosexual women. *International Journal of Social Research Methodology*, 8 (1), 47-60.

Corkindale, D., & Belder, M. (2009). Corporate brand reputation and the adoption of innovations. *Journal of Product & Brand Management*, 18(4), 242-250.

Curtis, T., Abratt, R., & Minor, W. (2009). Corporate brand management in higher education: the case of ERAU. *Journal of Product & Brand Management*, 18(6), 404-413.

da Silva, L. F. C., Barbosa, M. W., & Gomes, R. R. (2019). Measuring participation in distance education online discussion forums using social network analysis. *Journal of the Association for Information Science and Technology*, 70(2), 140-150.

Dollinger, M., Lodge, J., & Coates, H. (2018). Co-creation in higher education: Towards a conceptual model. *Journal of Marketing for Higher Education*, *28*(2), 210-231.

Elsharnouby, T. H. (2015). Student co-creation behavior in higher education: The role of satisfaction with the university experience. *Journal of marketing for higher education*, 25(2), 238-262.

Fagerstrom, A., & Ghinea, G. (2013). Co-creation of value in higher education: using social network marketing in the recruitment of students. *Journal of Higher Education Policy and Management*, 35(1), 45-53.

Gallouj, F., & Weinstein, O. (1997). Innovation in services. *Research Policy*, 26(4), 537-556.

Galvano, M., & Dalli, D. (2014). Theory of values creation: A systematic literature review. *Managing Service Quality*, 24(6), 643-683.

Garrett, R. (2004). The real story behind the failure of UK eUniversity. *Educause Quarterly,* 27(4), 4-6.

Gibbs, L., Kealy, M., Willis, K., Green, J., Welch, N., & Daly, J. (2007). What have sampling and data collection got to do with good qualitative research? *Australian and New Zealand Journal of Public Health*, 31(6), 540-544.

Gilbert, C. G. (2005). Unbundling the structure of inertia: Resource versus routine rigidity. *Academy of Management Journal*, 48(5), 741-763.

Granitz, N., & Greene, C. S. (2003). Applying e-marketing strategies to online distance learning. *Journal of Marketing Education*, 25(1), 16-30.

Hajli, N., Shanmugam, M., Papagiannidis, S., Zahay, D., & Richard, M. O. (2017). Branding co-creation with members of online brand communities. *Journal of Business Research*, 70(1), 136-144.

He, W., Xu, G., & Kruck, S. E. (2019). Online IS education for the 21st century. *Journal of Information Systems Education*, 25(2), 101-106.

Henderson, R. M., & Clark, K. B. (1990). Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms. *Administrative science quarterly*, 35(1), 9-30.

Kamboj, S., Sarmah, B., Gupta, S., & Dwivedi, Y. (2018). Examining branding co-creation in brand communities on social media: Applying the paradigm of Stimulus-Organism-Response. *International Journal of Information Management*, 39(1), 169-185.

Kara, M., Erdoğdu, F., Kokoc, M., & Cagiltay, K. (2019). Challenges faced by adult learners in online distance education: A literature review. *Open Praxis*, 11(1), 5-22.

Keller, K. L. (2003). Brand synthesis: The multidimensionality of brand knowledge. *Journal of Consumer Research,* 29(4), 595-600.

Keller, K. L., & Lehmann, D. R. (2006). Brands and branding: research findings and future priorities. *Marketing Science*, 25(6), 740-759.

Khanna, M., Jacob, I., & Yadav, N. (2014). Identifying and analyzing touchpoints for building a higher education brand. *Journal of Marketing for Higher Education*, 24(1), 122-143.

Lincoln, Y. S. and Guba, E. G. (2003). Paradigmatic controversies, contradictions, and emerging confluences, in NKDYS Lincoln (Ed.). *The Landscape of Qualitative Research*, pp. 253-291. California: Sage Publications.

McVea, K. L., Miller, D. L., Creswell, J. W., McEntarrfer, R., & Coleman, M. J. (2009). How adolescents experience smoking cessation. *Qualitative Health Research*, 19(5), 580-592.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Newbury Park: Sage Publications.

Ozbek, E. A. (2015). A classification of student skills and competencies in open and distance learning. *International Journal on New Trends in Education*, 6(3), 174-185.

Ponterotto, J. G. (2005). Qualitative research in counseling psychology: A primer on research paradigms and philosophy of science. *Journal of Counseling Psychology*, 52(2), 126-136.

Prahalad, C.K., & Ramaswamy, V. (2013). *The future of competition: Co-creating unique value with customers*. Boston: Harvard Business School Press.

Ranjan, K. R., & Read, S. (2016). Value co-creation: concept and measurement. *Journal of the Academy of Marketing Science*, 44(3), 290-315.

Rinaldi, C., & Cavicchi, A. (2016). Cooperative behaviour and place branding: a longitudinal case study in Italy. *Qualitative Market Research*, 19(2), 156-172.

Siemens, G. (2013). Massive Open Online Courses: Innovation in Education. *Open Educational Resources: Innovation, Research and Practice*, 5(1), 5-14.

Smith, D., Brand, J., & Kinash, S. (2013). Innovation in Education. *Education Technology Solutions*, 56(66), 66-70.

Stake, R. E. (2013). *Multiple Case Study Analysis*. New York: Guilford Press.

Stepchenkova, S., Kirilenko, A. P., & Morrison, A. M. (2009). Facilitating content analysis in tourism research. *Journal of Travel Research*, 47(4), 454-469.

Suomi, K., & Jarvinen, R. (2013). Tracing reputation risks in retailing and higher-education services. *Journal of Retailing and Consumer Services*, 20(2), 207-217.

Walter, A., Garrison, R. and Anderson, T. (2013). Adopting disruptive technologies in traditional universities: Continuing education as an incubator for innovation. *Canadian Journal of University Continuing Education*, 25(1), 13-44.

Whisman, R. (2009). Internal branding: a university's most valuable intangible asset. *Journal of Product & Brand Management*, 18(5), 367-370.

Yin, R. K. (2011). *Applications of Case Study Research*. Thousand Oaks: Sage Publications.

Yuzer, T. V. (2014). *Handbook of Research on Emerging Priorities and Trends in Distance Education: Communication, Pedagogy, and Technology: Communication, Pedagogy, and Technology,* (Ed.). Pennsylvania: IGI Global.

# BOOK REVIEW

# TEACHING IN A DIGITAL AGE: GUIDELINES FOR TEACHING AND LEARNING

## Written By Anthony William (Tony) BATES

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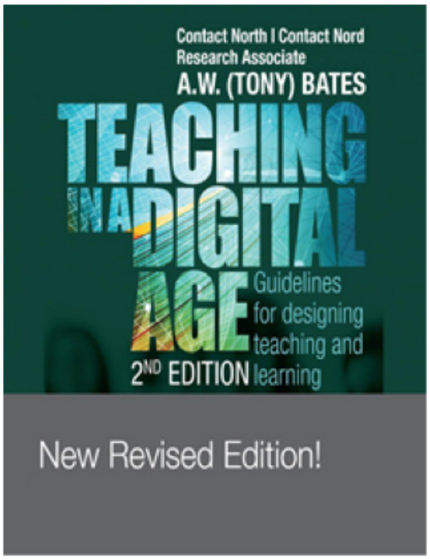


## INTRODUCTION

Dr. Tony Bates is a contemporary theorist in the field of educational technology. One of his most important books is Teaching in the Digital Age, which has received considerable attention around the world, and most of the educational planners and educators in the field of distance education use the book as a practical guide in the educational design of digital environments and is one of the internationally recognized sources in the field of online teaching. The book introduces the principles for effective teaching in an online environment and provides an instruction and guide for instructors about online teaching and learning and is also a good practice guideline for redesigning teaching and enables teachers and instructors to earn the knowledge and skills they will need in a digital age. This valuable collection has been translated into different foreign languages around the world includes translated versions in Turkish, Spanish, Vietnamese, French, Persian, Chinese, Portuguese, and is available on the BCcampus website in Canada as a recognized and credible open-source. Many countries are trying to translate the book Teaching in the Digital Age into the official language of their country in the future and make it available to researchers in the field of distance education.

## REVIEW Of THE BOOK

The book provides the essential principles for effective teaching, especially when using technology in teaching. Primarily, is intended for teachers and educators but it can also be helpful for students to develop the knowledge and skills needed in the digital age. Generally, the book Teaching in the Digital Age also is appropriate for use instructional designers to redesign the classrooms in the digital age and can help them make these decisions in the field of choosing face-to-face and online methods or a combination of these two methods. The book reviewer used two approaches and methodologies to review the book. The first step we provided based on the descriptive approach the essential information about specifications, content, and structure of the book then presented the goals of each chapter. Finally, the key features are described in the conclusion section with an analytical and critical perspective, also the book reviewer tries to analyze the second edition for the first time. To explain the topics of the book, first, refer to the book chapters, the book covers 13 chapters:

## Chapter 1

### Fundamental Change in Education

In the first chapter, the author states that we are in the digital age, and technology has surrounded us and has affected classrooms. Learners in digital environments need digital skills, as a result, communications skills, the ability to learn independently, ethics and responsibility, teamwork and flexibility, thinking skills, digital skills, knowledge management are the skills needed by learners in the world of technology. Today, the landscape of higher education has changed and technology is the focus of the classroom and most universities are moving towards open and online learning and the use of blended learning is rapidly increasing as a new teaching method in universities.

## Chapter 2

### The Nature of Knowledge and the Implications for Teaching

In Chapter two, Dr. Tony Bates tries to introduce the epistemological foundations of learning theories and states that our core beliefs and values are often shared by other professionals in a subject area and shape our approach to education and teaching. As a result, these beliefs are usually not explicitly stated and affect the whole teaching process in a classroom, and Learning theories are different and have different views on the nature of knowledge. Generally, Objectivism and behaviorism, Cognitivism, Constructivism, and Connectivism are from the main perspectives of epistemology and every educator is influenced by an epistemological perspective or learning theories in their teaching, although they may not be aware of their perspectives and beliefs.

## Chapter 3

### Methods of Teaching: Campus-Focused

In Chapter three, Dr. Tony Bates describes the different teaching methods, he believes that there is no single way to teach educators in the digital age. In this chapter, he argues that teaching methods that focus primarily on conceptual development such as dialogue and discussion, experiential learning, and practical learning in the real world are more appropriate for developing the skills needed in the digital age.

## Chapter 4

### Methods of Teaching with an Online Focus

In the fourth chapter, the main concept is teaching methods in online environments. The author believes that we need design models for teaching and learning that lead to the development of the skills needed in a digital age and there are no specific models for teaching in the digital age, and the choice of models depends on the environment in which it is used. Online collaborative learning, the ADDIE model, Competency-based learning is the most widely used design models in online and digital environments.

## Chapter 5

### MOOCs

Chapter five of the book is one of the most interesting chapters of the book, the readers are introduced to the concept of MOOCs as a new educational tool and a form of online learning. The focus of the chapter is on the types of MOOCs and their classification such as xMOOCs and cMOOCs, and at the end of the chapter, the strengths and weaknesses of MOOCs and their applications in the higher education system are provided as essential points.

## Chapter 6

### Building an Effective Learning Environment

In the sixth chapter of the book, the author tries to explain the concept of an effective learning environment. The learning environment generally influences learning, pedagogical and epistemological strategies and by reading the content of the chapter, readers are introduced to the various components of effective learning environments.

## Chapter 7

### Understanding Technology in Education

Chapter seven focuses more on the difference between media and technology in educational contexts, the author introduces six major media:

1. Face-to-face teaching
2. Text
3. Graphics
4. Audio
5. Video
6. Computing (including animation, simulations, and virtual reality).

In the continuation of the chapter three key characteristics or dimensions are introduced:

- Broadcast vs communicative
- Synchronous (live) vs asynchronous (recorded)
- Single vs rich media

In chapter seven, Dr. Tony Bates emphasizes that these characteristics or dimensions of media then need to be evaluated against the learning goals and outcomes desired, and professors can use powerful tools for teaching and learning by choosing rich communication and asynchronous media.

## Chapter 8

### Pedagogical Differences between Media

Chapter eight focuses on the pedagogical differences between the media. The author believes that the choice of media is generally influenced by the teaching philosophy, structural requirements in providing content, and skills needed by learners. One of the highlights of the chapter, which differs from the first edition of the book, is the introduction of emerging technologies such as virtual reality, augmented reality, simulators, artificial intelligence, and educational games. For this reason, the new topics of chapter 8 are the distinctive components in the difference between the first and second editions of the book.

## Chapter 9

### Choosing and Using Media in Education: The SECTIONS Model

The main purpose of the chapter is to provide a framework for making effective decisions about the choice and use of media for teaching and learning. The framework used is the SECTIONS model. The framework used is the SECTIONS model, which stands for:

- Students
- Ease of use
- Costs
- Teaching functions
- Interaction

- Organizational issues
- Networking
- Security and privacy

## Chapter 10

### Modes of Delivery

In Chapter 10, Dr. Bates states that there are four factors to consider when choosing the mode of delivery, (face-to-face or online).

- Student needs;
- Teaching strategy
- The pedagogical requirements of the subject matter
- The resources are available for an instructor.

And emphasizes that the move to blended or hybrid learning means reorganize the use of the campus and the facilities needed fully to support learning in a hybrid model.

## Chapter 11

### Trends in Open Education

The main focus of the chapter is on open educational sources, also Dr. Bates states that the availability of OER, open textbooks, open research, and open data means that in the future, almost more academic content will be open and freely accessible over the internet.

## Chapter 12

### Ensuring Quality Teaching in a Digital Age

One of the main differences between chapter 12 and other chapters of the book is the focus on quality issues. The chapter presents nine steps for teaching quality in the digital age, also presents a new different definition of quality. From the point of view of the author of the book, quality is teaching methods that successfully help learners develop the knowledge and skills they will require in a digital age.

## Chapter 13

### Supporting Teachers and Instructors in a Digital Age

The chapter focuses on supporting educators and learners in the digital age, and to develop such knowledge and skills in the digital age, teachers, and instructors need to set clear learning outcomes and select teaching methods that will support the development of such knowledge and skills. The move to blended, hybrid, and online learning and greater use of learning technologies offers more options and choices for teachers and instructors, as far as they can to be able to improve the skills needed by learners in the digital age.

## CONCLUSION

One of the salient points of the second edition of the book, which distinguishes it from the first edition, is the emphasis on the introduction of emerging technologies in education. The first edition of the book emphasizes the concepts, principles of learning in the digital age, and Dr. Tony Bates tries to explain the importance of the skills needed by learners in the digital age. From the point of view of the author of the book, learners and educators will not be successful in teaching and learning without the necessary skills in the digital age, but in the second edition of the book, the author tries to add new sections to the richness of the book, and in chapter 8 the author refers to emerging technologies in education such as serious games, gamification, virtual and augmented reality, and artificial intelligence, of course, in other chapters, the author has added new sections to the previous content, which has marked in green. After various reviews of the different books in the field of online learning, the book reviewer concluded that the book is one of the most prestigious international references in the field of online teaching in the digital age. We can describe the book with unique features such as:

## Merits of the Author of the Book

Dr. Tony Bates has a Ph.D. in educational administration from the Institute of Education, the University of London. He has been a professor of educational media studies at the Open University of England for 20 years, then emigrated to Canada at the end of 1989, where he worked for five years as the Executive Director of Strategic Planning at the British Columbia Open Learning Agency. He then became Director of Technology and Virtual Education at the University of British Columbia, where he designed, developed, and taught his first online courses and then helped launch the first fully online programs at UBC. In 2003 he was retired from UBC and set up a consulting company to provide specialized advice to universities, colleges, and government agencies on online and hybrid learning strategies. He has worked with more than 50 universities and colleges and several government agencies in Canada, the United States, and Europe and has contracted with the World Bank, UNESCO, and the OECD worldwide. In 2014, he decided to write a book with the title Teaching in the Digital Age, he has published the book as an open textbook through BCcampus, making this appreciable work available to a global readership as a unique work.

He also has written eleven books on educational technology and distance learning and has been translated into many languages including French, Chinese, Spanish, Korean, Serbian, Vietnamese, Portuguese, Arabic, Turkish. He also holds honorary degrees from the Open University of Portugal, the Open University of Catalonia, the Open University of Hong Kong, the University of Athabasca, and Laurentian University. The book reviewer strongly agrees with Dr. Sir Daniel at the University of London that Tony Bates is one of the global most literate and mindful scholiasts on educational technology.

## Multiple and Different Audiences

The text is most appropriate as a practical reference for researchers about teaching and learning in the digital age, also the book has different audiences including school educators, faculty members, curriculum designers, educational technologists, college heads, and educational policymakers, and students.

## International and Global Dimension

A notable feature of the book is public acceptance at the global level. Today, in many developing countries that are not native English speakers, they are facing a shortage of valid and international resources, therefore these countries have to translate top books from other countries especially from English into their languages. Translating such books can be very helpful as a practical guideline for teaching and learning in education, the book Teaching in a Digital Age has been translated into many languages and is used in most universities and academic centers in the field of online teaching and learning. These translations show that this valuable collection has universal respect and attention, also the text is an international book without any discrimination or prejudice in matters of culture, gender, ethnicity, national character, age, disability, education, also all translations of the book are available together on the BC campus website, and it is available as an open-source to the public and those interested in the field of online learning.

## Comprehensiveness

The text has comprehensiveness very high and covers all areas and ideas of the subject appropriately and reflects all the components and concepts of educational technology from the past to the present. Dr.Tony Bates has tried to introduce the activities of prestigious universities around the world in the field of distance education innovations from North America to Canada and from Asia to Europe and Africa, he also introduced global and leading findings in distance education and educational technology so that the reader gets a comprehensive view of the virtual education topics, as a result, the audience can get acquainted with leading and progressive universities in the field of distance education after reading the book.

### Structure and Sequences

The topics in the text have been expressed in a rational, clear manner and throughout the book, the author has used fixed and specific terminology. The content and sections of the book are very relevant and they have a regular sequence, also there were no noted grammatical or spelling errors and the language of the book is very pleasant and impressive along with interesting analogies. The structural form such as the table of contents, chapters, and subsections provides a clear intellectual order for reading the contents of the book so that chapters begin with a statement of purpose and conclude with keynotes, as a result, the reader can follow the goals of each chapter and at the end of each topic, and also activities are considered at the end of each chapter. The references of the chapter are provided at the end of each chapter with an access link and each chapter is divided into subsections so that create a concept map in the reader's mind and the author has tried to present each chapter with a tutorial scenario to stimulate the minds of the audience in understanding the topics. Generally, content is up-to-date, especially in the second edition and the text is written in transparent, accessible prose and has no bias.

### Dynamic Activities

The book contains a variety of activities and questions that are presented throughout chapters and these questions most often aim to require readers to analyze and evaluate issues from their point of view. The different activities such as scenarios, stories, conversations in a way that actively attracts the reader to understand the content, concepts, and methodology, and in general, the reader is engaged in solving exercises and activities and at the end of each section provide an opportunity for audiences to express their views on the questions raised and as a result, an intellectual communicate is created with the author of the book. The readers can receive information by click on the podcasts, in general, the book considers as a flexible and dynamic source.

### Use a Combination of Text, Photos, and Videos with Hyperlink Features

One of the prominent features of the book is the use of very clear, relevant, and attractive images, pictures and photos, and videos, in this way the reader can understand the whole subject by looking at the pictures and graphs. The author has used a variety of global examples from around the world and the references of the book have hyperlinks and readers can view the sources by clicking on the references. Overall, the author has attempted to shows an understandable and alive image of issues through various photos and videos.

### Top Author Experience

One of the highlights of the book is that the author has presented 40 years of international experience in higher education especially in the field of educational technologies and distance education in England, Canada, and around the world. Dr. Tony Bates also is one of the most famous contemporary theorists in the field of education technology and distance education, therefore he has experience setting up the first online courses in the 1980s at the University of London and is one of the outstanding designers of distance education internationally. The author of the book is very familiar with Asian and Middle Eastern countries, he has come to these countries to do a consultancy and to help with the design and operation of open universities in the past years.

### A Free and Well Known Open-Source on Bccampus

The book with translations into different languages is available on the BCcampus website as an open-source and audiences can access to book easily and freely via mobile or tablet and since the book access is an open and electronic source, it has become a user-friendly book. It should also be noted that BCcampus focus is to support the academic institutions of British Columbia as they apply their teaching and learning practices to create a better experience for students.

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**Dr. Mohsen KESHAVARZ,** has a Ph.D. in virtual education planning. Currently, he is a faculty member and the Director of the Virtual Education Center of Torbat Heydariyeh University of Medical Sciences now. His research interests include online and virtual learning, blended learning, telemedicine, new educational technologies, e-health, and multiple literacies in online environments. He has published several articles on virtual education in the international Journal. He is an energetic advocate of distance learning in his home country of Iran, having translated Tony Bates's book *Teaching in a digital age* to Persian in addition to several other projects, some with international collaborators. He has recently been introduced as an international figure in the field of online learning by the site of leaders & legends of online learning.

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## REFERENCES

Bates, T. (2019). *Teaching in A Digital Age - Guidelines for Designing Teaching and Learning.* (2nd Edition). Vancouver: BC Campus / Contact North, Contact Nord.

# BOOK REVIEW

# ADOPTION OF DATA ANALYTICS IN HIGHER EDUCATION LEARNING AND TEACHING

## Edited by Dirk IFENTHALER and David GIBSON

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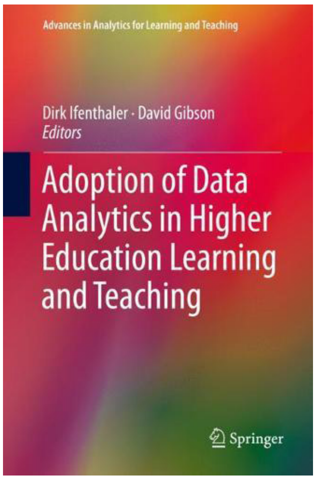


Adoption of Data Analytics in Higher Education Learning and Teaching is edited by Dirk Ifenthaler and David Gibson. This book was published by Springer in 2020 and also this book has 464 pages. The meta data of the book is as followings: ISBN: 978-3-030-47391-4; ISBN: 978-3-030-47392-1; DOI: 10.1007/978-3-030-47392-1

The book consists of 21 chapters in three parts. These parts and chapters are:

*Part I: Focusing the Organisation in the Adoption Process:* Chapters 1-7

*Part II: Focusing the Learner and Teacher in the Adoption Process:* Chapters 8-14

*Part III: Cases of Learning Analytics Adoption:* Chapters 15-21

## INTRODUCTION

Data science is a very important factor in the development of educational environments and in institutions, especially in higher education, to make sustainable studies. Higher education institutions can benefit from educational data mining and learning analytics by adopting different data analytics strategies to improve recommendations for the future of the institutions. From a perspective supporting the issue, this book "Adoption of Data Analytics in Higher Education Learning and Teaching" edited by Dirk Ifenthaler and David Gibson presents valuable insights and contributions to higher education institutions regarding the adoption of learning analytics and educational data mining. This book also examines case studies that describe current practices and experiences about the use of data analytics in higher education.

## REVIEW OF THE BOOK

The structure of the book divided into three parts consisted of 21 chapters. Part I: Focusing the Organization in the Adoption Process, Part II: Focusing the Learner and Teacher in the Adoption Process, and Part III: Cases of Learning Analytics Adoption.

### Part I: Focusing the Organization in the Adoption Process

The first part of the book offers seven chapters about the process of learning analytics adoption, politics of learning analytics, various frameworks and perspectives on the implementation of learning analytics.

Chapter 1: *Adoption of Learning Analytics* authored by David Gibson and Dirk Ifenthaler identifies Innovation Diffusion as the theoretical perspective on the adoption of learning analytics and focuses on the new adoption models and frameworks which are necessary for the integration of learning analytics systems into higher education institutions.

Chapter 2: *The Politics of Learning Analytics* by Reem Al-Mahmood examines promises and challenges of adoption learning analytics and big data in higher education institutions and also provides insights into how higher education institutions interpret the process of adoption of algorithmic and datafied education.

Chapter 3: *A Framework to Support Interdisciplinary Engagement with Learning Analytics* by Stephanie J. Blackmon and Robert L. Moore focuses on how learning analytics has an effect to accelerate interdisciplinary approach for student engagement and support.

Chapter 4: *The Framework of Learning Analytics for Prevention, Intervention, and Postvention in E-Learning Environments* authored by Muhittin Sahin and Halil Yurdugul points out theoretical concepts of prevention, intervention and postvention considering their contribution to learning analytics. By reviewing the studies about this context, this study presents a proposed framework based on learning analytics, prevention, intervention and postvention studies.

Chapter 5: *The LAVA Model: Learning Analytics Meets Visual Analytics* authored by Mohamed Amine Chatti, Arham Muslim, Manpriya Guliani, and Mouadh Guesmi introduces a model named Learning Analytics and Visual Analytics (LAVA). Thanks to the LAVA model, learning analytics data was collected from different sources and the model was evaluated in terms of model, usefulness and usability.

Chapter 6: *See You at the Intersection: Bringing Together Different Approaches to Uncover Deeper Analytics Insights* by David Paul Fulcher, Margaret Wallace, and Maarten de Laat explores out an adoption of learning analytics process through six years and current practices of an Australian University in order to advance on implementing institutional approaches to learning analytics.

Chapter 7: *"Trust the Process!": Implementing Learning Analytics in Higher Education Institutions* by Armin Egetenmeier and Miriam Hommel analyzes the implementation process of learning analytics in terms of current issues, challenges and new approaches and models at Aelen University of Applied Science.

### Part II: Focusing the Learner and Teacher in the Adoption Process

The second part of the book includes seven chapters highlighting roles of learners and teachers throughout the adoption process of learning analytics.

Chapter 8: *Students' Adoption of Learner Analytics* by Carly Palmer Foster investigates how the learners' predispositions change according to data and analytics and also analyzes the factors affecting the adoption process of extracted learner analytics named "Connect Analytics" at Northumbria University in the United Kingdom.

Chapter 9: *Learning Analytics and the Measurement of Learning Engagement* authored by Dirk Tempelaar, Quan Nguyen, and Bart Rienties intends to ensure 'multi-modal data'-based contribution to the research of student engagement in learning by highlighting both quantitative and qualitative aspects of engagement.

Chapter 10: *Stakeholder Perspectives (Staff and Students) on Institution-Wide Use of Learning Analytics to Improve Learning and Teaching Outcomes* by Ann Luzeckyj, Deborah S. West, Bill K. Searle, Daniel P. Toohey, Jessica J. Vanderlelie, and Kevin R. Bell centers upon three different studies undertaken with university staff and students concerning the use of learning analytics to make more efficient and structured learning and teaching experiences.

Chapter 11: *How and Why Faculty Adopt Learning Analytics* authored by Natasha Arthars and Danny Y.-T. Liu studies on the analysis of empirical evidence based on teachers' perceptions and needs regarding adoption and diffusion of learning analytics platform (Student Relationship Engagement System) across an Australian University.

Chapter 12: *Supporting Faculty Adoption of Learning Analytics within the Complex World of Higher Education* by George Rehrey, Marco Molinaro, Dennis Groth, Linda Shepard, Caroline Bennett, Warren Code, Amberly Reynolds, Vicki Squires and Doug Ward focuses on the design to learn about a multi-case study designed on learning analytics in higher education.

Chapter 13: *It's All About the Intervention: Reflections on Building Staff Capacity for Using Learning Analytics to Support Student Success* by Ed Foster, Rebecca Siddle, Pete Crowson and Pieterjan Bonne identifies the challenges of building staff abilities using data from learning analytics.

Chapter 14: *Experiences in Scaling Up Learning Analytics in Blended Learning Scenarios* by Vlatko Lukarov and Ulrik Schroeder underlines the problems of scaling up learning analytics in blended learning scenarios in a higher education institution in Germany.

## Part III: Cases of Learning Analytics Adoption

The third part of the book contains seven chapters concerning current practices and studies of learning analytics adoption.

Chapter 15: *Building Confidence in Learning Analytics Solutions: Two Complementary Pilot Studies* by Armelle Brun, Benjamin Gras and Agathe Merceron investigates two studies designed to point out students' dropout reasons affecting student success at two higher education institutions in Germany and France.

Chapter 16: *Leadership and Maturity: How Do They Affect Learning Analytics Adoption in Latin America?* by Isabel Hilliger, Mar Pérez-Sanagustín, Ronald Pérez-Álvarez, Valeria Henríquez, Julio Guerra, Miguel Ángel Zuñiga-Prieto, Margarita Ortiz-Rojas, Yi-Shan Tsai, Dragan Gasevic, Pedro J. Muñoz-Merino, Tom Broos and Tinne De Laet highlights the studies carried out on learning analytics in Latin America and explains what is required to increase the adoption of learning analytics in the region.

Chapter 17: *Adoption of Bring-Your-Own-Device Examinations and Data Analytics* by Robyn Fitzharris and Simon Kent sheds light on a case study of successful implementation of digital examination providing data analysis not only at the end of the process, but also on the production process. The bring-your-own-device (BYOD) examination concept is about a locked-down browser environment installed on students' own laptops which prevents access to online sources with certain restrictions.

Chapter 18: *Experiential Learning in Labs and Multimodal Learning Analytics* by Anke Pfeiffer, Vlatko Lukarov, Giovanni Romagnoli, Dieter Uckelmann and Ulrik Schroeder focuses on the learning analytics in laboratory-based learning environments.

Chapter 19: *Web Analytics as Extension for a Learning Analytics Dashboard of a Massive Open Online Platform* by Philipp Leitner, Karin Maier and Martin Ebner illustrates features and functions of learning analytics dashboards to improve the learning process in massive open online courses (MOOCs).

Chapter 20: *A Dimensionality Reduction Method for Time Series Analysis of Student Behavior to Predict Dropout in Massive Open Online Courses* by Eric G. Poitras, Reza Feyzi Behnagh and Francois Bouchet sorts out the results of existing machine learning techniques and several preprocessing techniques with the purpose of modeling attrition in MOOCs.

Chapter 21: *Evidence-Based Learning Design Through Learning Analytics* by Esin Caglayan, O. Osman Demirbas, Ali Burak Ozkaya and Mehmet Sahin clarifies the similarities between instructors' opinion on their course design archetype and the archetype provided by Blackboard Analytics.

## CONCLUSION

Data analytics is seen as an essential element to improve higher education learning and teaching environments as a reflection of learning analytics and educational data mining technologies. This book presents critical perspectives and essential frameworks and methods on the adoption process of learning analytics by providing case studies, current practices and experiences and innovative approaches. In this regard, Adoption of Data Analytics in Higher Education Learning and Teaching is a valuable reference for higher education staff, administrators, educators, practitioners, academicians, curriculum developers, instructional designers, policymakers, and researchers who want to learn more about the adoption of learning analytics in higher education institutions.

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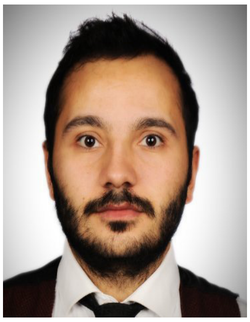

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## REFERENCES

Ifenthaler, D., & Gibson, D. C. (Eds). (2020). *Adoption of Data Analytics in Higher Education Learning and Teaching.* Cham: Springer.