ANADOLU UNIVERSITY

Turkish Online Journal of Distance Education

April 2024

TOJDE

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Table of Contents

Dear TOJDE Readers,

Welcome to Volume 25 Issue 2 of TOJDE

There are 15 articles in the April 2024 issue of TOJDE. 34 authors from 6 different countries contributed to the issue. These countries are Indonesia, Nigeria, Oman, Russia, South Africa and Turkiye.

PROFICIENCY OF TEACHERS' PERCEPTIONS OF DISTANCE EDUCATION AND TECHNOLOGY USAGE COMPETENCIES: A META-ANALYSIS STUDY authored by Savas VARLIK is the 1st article. In this study, it was aimed to examine the perceptions of distance education and the effect size of technology usage competencies by using meta-analysis method. In the meta-evaluation carried for this purpose, twenty-eight studies that met the criteria for inclusion in the research were reached. Results are discussed in the end of the article.

The 2nd article, VIRTUAL SIGN LANGUAGE INTERPRETATIONS IN OPEN AND DISTANCE EDUCATION: A PROBE INTO 'ENABLERS' AND 'CONSTRAINTS', is written by Sindile Amina NGUBANE and Olufemi Timothy ADIGUN. Based on the Job Demand Resources Model, two research questions were raised and answered in this paper. Based on the findings, appropriate recommendations are made by the authors.

The title of the 3rd article is THE INVESTIGATION OF ORGANIZATIONAL CULTURE ELEMENTS AND TYPOLOGIES IN A GIGA OPEN UNIVERSITY: ANADOLU UNIVERSITY OPEN EDUCATION FACULTY 40th YEAR RESEARCH. The authors are Guzin KIYIK KICIR and Asu ALTUNOGLU. The purpose of this article is to reveal the functioning of the elements that make up the organizational culture of the Open Education Faculty in the institution and the types of culture that are seen as dominant in the organization. The results of the qualitative content analysis revealed that Anadolu University Open Education Faculty has a strong and established culture, and this contributes to the work done and institutional development.

Nilgun TOSUN and Soner ALTINTAS are the authors of the 4th article. This article is titled AN EVALUATION OF TEACHERS' VIEWS ON OPEN EDUCATIONAL RESOURCES. The objective of this study is to determine the ways in-service teachers in Turkiye make use of open educational resources and their opinions on using them. For this purpose, the explanatory sequential design has been employed. The results are discussed in the article.

FOUR SCENARIOS OF PERSONALIZED LEARNING INTEGRATION MEDIATED BY A DIGITAL PLATFORM is the title of the 5th article, and the authors are Mikhail SHCHEVLIAGIN and Diana KOROLEVA. This study investigates personalized learning at the secondary education level underpinned by a digital platform. The personalized learning integration is analyzed from the perspective of teacher practice which integrates the digital platform built on the personalized learning methodology. The scenarios are explained and discussed in the article.

The authors of the 6th article are Murat CINAR, Omer DEMIR and Sinan KESKIN. The title is SOCIAL ANXIETY IN ONLINE INSTRUCTIONAL DISCUSSION FORUMS: THE ROLE OF PARTICIPATION STYLES AND ICT INFRASTRUCTURE. This research investigates variances in learners' participation styles and social anxiety in Instructional Discussion Forums in terms of gender and ICT availability. Based on the findings, future directions and practical implications are suggested for both researchers and practitioners.

The title of the 7th article is THE IMPACT OF DIGITAL TRANSFORMATION AND LEADERSHIP ON ORGANIZATIONAL RESILIENCE IN DISTANCE EDUCATION INSTITUTION: HIGHER-ORDER SEM APPROACH. FIRMANSYAH, Gustriza ERDA and Arie Wibowo KHURNIAWAN are the authors. This study aims to determine the impact of digital transformation and leadership capability in maintaining the organization, particularly in distance education. This study used questionnaires distributed

to 402 students to obtain their opinions on digital transformation, leadership capability, and organizational resilience in Universitas Terbuka. The results indicates that there is a positive and significant impact of digital transformation and leadership capability on the organizational resilience of Universitas Terbuka.

THE EFFECTS OF GROUP-BASED PERSONALIZED ONLINE TEACHING ON LEARNERS' COMMUNITY OF INQUIRY AND ACHIEVEMENT OF COURSE is the 8th article, and the author is Baris SEZER. The aim is to investigate the effects of delivering group-based personalized teaching via an electronic performance support system in an online medical informatics course on medical students' academic achievement and community of inquiry levels. The group personalized teaching method used in this study could be a guide for future studies.

Kelly YOUNG and Angelo FYNN are the authors of the 9th article. The title of this article is GRIT, RETENTION AND STUDENT SUCCESS IN A SOUTH AFRICAN DISTANCE EDUCATION INSTITUTION: A POSTGRADUATE TRIAD? This study makes use of a non-experimental design and used Grit-S and demographic data combined with records of student performance and progression to ascertain grit's role in determining retention and degree completion at a mega distance education institution in South Africa. Results from the final structural model highlight the significant influence of perseverance and first-to-second year retention on student success (operationalized at qualification completion). Results and subsequent implications are discussed in the article.

The 10th article is TEACHERS' READINESS FOR BLENDED LEARNING, THEIR REASONS, CHALLENGES, AND SUGGESTIONS FOR PRACTISING BLENDED LEARNING. The authors are Ayşegul LIMAN KABAN, Esra YATAGANBABA, Alev ATES COBANOGLU and Mehmet KOKOC. This study aims to understand the experiences of Turkish teachers in blended learning, the challenges they encountered, and their recommendations in this regard. The results can help both pre-service and in-service teachers to be sensitive toward their blended teaching competencies. This study also has the potential for informing teacher education departments to equip prospective teachers with required disciplinary knowledge along with digital competencies.

The 11th article which is authored by Baris BULUNMAZ and Ramazan BILGE is titled A RESEARCH ON THE EFFICIENCY OF DISTANCE EDUCATION IN UNIVERSITIES DURING THE PANDEMIC. This study aims to examine the effects of the devastation caused by the pandemic on students at the higher education level in the context of efficiency. The data obtained was subjected to reliability and validity analysis, and it was by using the SPSS program. The results are examined with different dimensions.

The title of the 12th article is GRIT, RETENTION AND STUDENT SUCCESS IN TEACHERS' OPINIONS ON TECHNOLOGY LEADERSHIP ROLES OF SCHOOL PRINCIPALS DURING THE COVID-19 PANDEMIC, and the authors are Yucel SIMSEK, Tamer SERT and Beyza HIMMETOGLU DAL. The study, which utilizes qualitative research methods, is designed as a survey study. Based on the results, some recommendations which can contribute to both implementation and theory have been developed. Accordingly, conducing researches which employ multiple data collection methods and tools to investigate technology leadership roles of school principals is considered important.

The 13th article, THE EFFECT OF USING WHATSAPP BOT ON ENGLISH VOCABULARY LEARNING, is authored by Ali AL GHAITHI, Behnam BEHFOROUZ and Hassan ISYAKU. This study tries to design a WhatsApp bot to be implemented in English language vocabulary learning context in Oman. The study highlights that chatbots could be the best supplementary materials assisting teaching in delivering materials.

DEVELOPMENT OF INSTAGRAM-BASED LEARNING MEDIA TO INCREASE STUDENTS LEARNING INTEREST IN ACID-BASE MATERIALS is the 14th article and the authors are Afis Baghiz SYAFRUDDIN, Hayuni Retno WIDARTI and Deni Ainur ROKHIM. This study aims to determine the feasibility of Instagram-based chemistry learning media and the results of increasing student interest

in learning acid-base material in everyday life with a multi-representation approach. The method used in this study is the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) research and development model. The results show the importance of expert validators and learning motivation.

Zehra Tugba GUZEL is the author of the 15th article, titled AN EVALUATION OF PERSONALIZED LEARNING BY ONLINE INFORMAL EDUCATION IN CASE OF DESIGN EDUCATION. This study aims to identify the contributions and limitations of informal learning in personalization. According to this article, with equal access and fair and accurate evaluation mechanisms, informal online education can help professionals develop unique, global, and harmonious perspectives.

Hope to meet again in the next issue of TOJDE.

Cordially,

Dr. T. Volkan YUZER

Editor in Chief

PROFICIENCY OF TEACHERS' PERCEPTIONS OF DISTANCE EDUCATION AND TECHNOLOGY USAGE COMPETENCIES: A META-ANALYSIS STUDY

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Received: 19/03/2023 **Accepted:** 14/07/2023

ABSTRACT

In this meta-analysis study, it was aimed to examine the perceptions of distance education and the effect size of technology usage competencies by using meta-analysis method. In the meta-evaluation carried for this purpose, twenty-eight studies that met the criteria for inclusion in the research were reached. By combining these studies, 11.797 sample groups were studied. In order to reach a general decision in the research, a funnel plot graph was drawn before statistical calculations were made. Statistical calculations were performed in order to make a general impression decision about the publication bias in the funnel plot diagram. When the statistical analysis results and the diagram graph results were combined, it was determined that there was no publication bias in the studies included in the study. Then, a heterogeneity test was performed to determine the model type of the research. According to the results of the heterogeneity test, it was decided that this research should be interpreted according to the type of random effects model. For heterogeneity, publication type, school type, and branches were aimed as moderators. It was observed that the meta-analysis study had a small distribution of perceptions of distance education and technology usage competencies, that the variables of publication type, school type and distribution departments did not have a moderator unit in the calculations done on the moderator, but it was concluded that the effect sizes of the studies published as articles, the studies carried out in secondary education institutions and the studies on mathematics teachers had a relatively larger effect size than the others.

Keywords: Teacher, distance education, perception of distance education, technology use adequacy.

INTRODUCTION

The unpredictable rapid daily changes and innovations of technology have led to the diversity and proliferation in all areas of life (Moroz & Moroz, 2022), so that users can easily access the information they want (Avsec & Savec, 2021). These situation variables have made all institutions open and ready for constant change (Cachero-Gonzalez et al., 2019). Like all fast systems that occur in scientific, technological and social systems, significant changes have occurred in the functions that education expects to fulfill (Baptista et al., 2020). This has also led people towards a structure where educational environments and knowledge can be consumed outside of the traditional understanding of education (Gillet-Swan, 2017). The biggest payment suspicion in the direction of societies is education rights (Bell et al., 2013). Because education continues to meet the needs of society. For this reason, it is a fact that the education of students who adapt to the information age and technologies, desires and tries to regulate society education policies accordingly (Grabinski et al., 2020). The places where they emerged at times, surrounding them, social shelter differentiation was affected by education, and the programs that would constantly maximize learning were maintained on systems (Fis Erumit, 2021). In fact, distance education models have begun to be developed, in which a different approach is needed from the traditional education model dominated by the trio of students, classrooms and teachers (Adom, 2020; Kopcha, 2012). The need for the development of a distance education model, the integration of distance education with computer programs (Bulut et al., 2022), the need to access information over the

internet faster, easier and at lower prices by using multimedia tools and techniques (Gurcan et al., 2021). Lee et al., 2022) helped increase a user's interaction with emerging technologies. Rapid population growth, epidemics and other factors also required a structural replanning of the world's education systems (Celik et al., 2022). Educators and education stakeholders also believe in the need for replanning rather than the traditional structure in education (Alghamdi et al., 2022; Baleghi et al., 2017; Pittman & Gaines, 2015). Because countries have gone beyond traditional education structures and focused their efforts on finding ways to provide better and cheaper education to more people (Burac et al.,2019). As a result of all these, the distance education model approach has been adopted as a new approach in education (Goncalves, 2017). Distance education is an education model or approach in which teachers and students perform a learning-teaching activity in different places without time and place limitations (Adzobu, 2014; Bozkurt, 2020). Teachers believe that distance education appeals to a wide student population, is student-centered (Hamann et al., 2020), supports lifelong learning (Makokotlela, 2022), provides flexibility in terms of time and space (Palloff & Patt, 2007), has a small budget. They state that distance education is effective in the learning process (Park & Shea, 2020), based on the idea that more people can be reached with this program (Yu, 2021). However, although distance education is thought to be effective by teachers, this has also led to the questioning of teachers' technology use competencies around the world (Mnguni & Mokiwa, 2020). Because the role of teachers in the use of technology in the field of education is very important and great. The teacher's attitude towards technology, his or her efforts to use technology consciously (Stuart et al., 2022), his or her understanding of the nature of technology (Ozkan & Tekeli, 2021), his or her design of technology (Tondeur et al., 2017), questioning what the effects are on the society he or she lives in (Yavuz et al., 2020) and the effective use of technology in education and extracurricular activities (Panisoara et al., 2020) affect students. The main element that adds functionality, spirit and meaning to education and makes it efficient and effective is the teacher (Mashroofa et al.,2019). For this reason, world education ministries expect teachers to have the competence to use information and communication technologies effectively in the field of managing the learning and teaching process, in addition to the general competencies of the teaching profession (Agyei & Voogt, 2011; Topchyan & Zhang, 2014; Sangra et al.,2012; Zhang et al., 2020). In addition, it is emphasized that teachers and teacher candidates responsible for the qualified education of individuals should have the characteristics that can renew and develop themselves in the face of rapidly changing and developing conditions as a requirement of the information society (Koyuncu et al., 2022). Teachers are not only responsible for implementing the curriculum in the education process (Altunoglu, 2017; Hodges & Cullen, 2020). They are also responsible for acquiring, developing, and making permanent the knowledge, skills and equipment that students will need (Keegan, 1980; Morante et al., 2017). On the other hand, in the world education perspective, the qualifications that teachers should have are still the leading topics of discussion (Chugh et al., 2017; Sadaf et al.,2016). Hundreds of qualifications can be expected from a teacher (Leidner & Jarvenpaa, 1995), but qualifications are determined in educational institutions considering social needs (Lautenbach & Randell, 2020), individual needs (Yavuz et al., 2021), technological and scientific developments (Kim, 2020). However, the fact that teachers are technologically qualified and equipped is one of the most important competencies (Tilton & Hartnett, 2016). Therefore, the existence of technological competence among teachers' ability to perform and evaluate their duties effectively (Zawacki-Richter et al., 2009) can be considered as the basic criterion both for the distance education process and for the student to achieve the necessary gains.

When the studies on the subject in the related literature are examined, it was determined that hundreds of primary studies were done to determine the level of teachers' perceptions of distance education and technology use (Aldaghri & Oraif, 2022; Ali, 2020; Altinay, 2017; Amoozegar et al., 2018; Dalton, 2001; Elcicek, 2021; Elizabeth et al., 2020; Gorghiu et al., 2021; Hodges & Cullen, 2020; Kopcha, 2012; Makamure & Tsakeni, 2020; Makokotlela, 2022; Sadaf et al., 2016; Tilton & Hartnett, 2016; Tondeur et al., 2017; Wang, 2022; Yaylak, 2022). However, it was determined that the primary studies could not be synthesized and interpreted with a statistical result and a judgment could not be reached on whether they worked in practice or not. Due to the importance of research syntheses in the decision-making process, as highlighted by Borenstein et al. (2019), Chen & Peace (2021), Rothstein, Sutton & White (2021), Egger, Higgins & Smith (2022), Varlik & Gunbayi (2020), and Schmid, Stijnen & White (2021), it became necessary to synthesize teachers' perceptions of distance education and their effectiveness in technology use competencies. Relying solely on primary studies would not be sufficient for making informed decisions.

Therefore, the aim of this research was to investigate teachers' perceptions of distance education and the effectiveness of technology use competencies using the meta-analysis method.

In line with the research objective, the following hypotheses were formulated for the meta-analytical analyses:

H_1: The effect size of teachers' perceptions of distance education and technology use proficiency is positive.

H_2: The type of publication variable plays a moderator role in the effect size of teachers' perceptions of distance education and technology use competencies.

H_3: The type of school where teachers work plays a moderator role in the effect size of teachers' perceptions of distance education and technology use competencies.

H_4: The branch (subject area) variable plays a moderator role in the effect size of teachers' perceptions of distance education and technology use competencies.

METHOD

Model and Paradigm of the Research

With this research, it was aimed to investigate the effect size of teachers' perceptions of distance education and their technology use competencies by using meta-analysis method. Many definitions of the meta-analysis method have been made in the relevant literature, such as a statistical method a statistical method that combines studies on the same subject to make a general judgment (Cooper, Hedges & Valentine, 2019), which combines experimental findings from individual studies (Harrer et al., 2022), analyzes (Stangl & Berry, 2000), converts many research results into a common unit of measurement (Cheung, 2015) and calculates statistical effect sizes (Dias et al., 2018), combining the results of many small individual studies with one or more statistical methods (Khan, 2020), providing a systematic review to estimate effect sizes in the population (Cooper, 2017), consideration of primary studies conducted with a quantitative approach (Borenstein et al., 2019) and definitions of the meta-analysis method were made with the expressions of the method that combines these studies (Cooper, Hedges & Valentine, 2019) in order to reach a general decision about the primary studies conducted on similar topics. In addition, realism as philosophy and functional paradigm as a paradigm are based on this research. The functional paradigm is a paradigm approach in which reality is objectively considered, which argues that the social world we live in is also relatively unchangeable (Gunbayi & Sorm, 2020).

Types of Meta-Analysis and Effect Size

This study is a group comparative meta-analysis aimed at examining the effectiveness of teachers' perceptions of distance education and their technology use competencies. Effect size is a value calculated in meta-analysis studies that reflects the magnitude of the relationship between two variables or the magnitude of the application effect (Hartung, Knapp & Sinha, 2008). It indicates how the independent variable positively or negatively influences the dependent variable. The weighted average of the studies included in the research is referred to as the overall effect (Littell, Corcoran & Pillai, 2008). The diamond-shaped symbol in the forest plot diagram represents the magnitude of the predicted sensitivity and also serves as an indicator of the effect size (Rothstein, Sutton & White, 2021). In meta-analysis studies, effect sizes are typically calculated as average differences, odds ratios, and correlation coefficients (Zoccai, 2018). Similarly, in this research, the effect sizes of the studies included in the meta-analysis were calculated based on average differences.

Model Selection and Identification of Outliers

In meta-analysis studies, the calculation of overall effect sizes is typically performed using both the random effects model and the fixed effects model. The fixed effects model (Cleophas & Zwinderman, 2017) assumes that all studies are the same, while the random effects model (Egger, Higgins & Smith, 2022) assumes that the included studies are different due to variations in measurement tools. In this research, the inclusion criteria and measurement tools of the studies were different. Therefore, the selection of the effect size model

was determined through the heterogeneity test. Heterogeneity tests can identify not only the determination of the effect size but also the presence of moderator effects (Cumming, 2012). However, the presence of outliers in the included studies may lead to unexpected increases (Schmid, Stijnen & White, 2021), and outliers can be particularly high in meta-analysis studies (Simske, 2019). Consequently, it may be challenging to detect errors in the original studies (Ellis, 2010; Patole, 2021). Hence, the weights of the studies in this research were calculated using both the random effects and fixed effects approaches. Even though the weights assigned to the studies included in the meta-analysis were similar, the analysis results presented in Table 8 were derived using the random effects model.

Publication Bias

Publication bias refers to the phenomenon where the published literature does not accurately represent the full population of completed studies in a particular field (Hedges & Olkin, 1985). It occurs when the available research differs in its findings from the results of all research conducted on a given topic, leading readers and reviewers to potentially draw incorrect conclusions (Hangji, 2017). This can have significant implications, especially when an ineffective or harmful treatment is mistakenly perceived as safe and effective (Riley, Tierney & Stewart, 2021). Publication bias is a concern across various research domains, including meta-analysis (Chen & Peace, 2021). While it is difficult to completely eliminate publication bias as long as research is conducted and reported, recent years have seen increased awareness and attention to this issue, particularly with the rise in the use of systematic review and meta-analytical methods to summarize research findings (Rothstein, Sutton & White, 2021). As review methods become more rigorous and quantitative, the process of reviewing and synthesizing research is increasingly regarded as parallel to the primary research process (Lipsey & Wilson, 2001). Formun Ustu

Data Collection and Inclusion Criteria

The aim of this study was to examine the effectiveness of teachers' perceptions of distance education and their technology use competencies. To achieve this objective, empirical studies conducted between the years 2020-2022 were sought, considering the extensive literature on distance education. The inclusion criteria for the research were as follows: studies conducted in Turkiye between 2020-2022, studies containing information suitable for meta-analysis calculation, studies with teachers as the sampling group, and studies available in the National Thesis database of the Council of Higher Education.

A literature review was conducted using keywords such as "distance education," "teachers' perceptions of distance education," and "teachers' technology usage competencies." The search was carried out in databases including Dergi Park, the Council of Higher Education National Thesis Center, Turkish Education Index, Tr Index, and Academic Directory. Purposeful sampling was employed in the screening process, which allowed for an in-depth examination of studies that met the desired research criteria (Creswell & Creswell, 2018). A total of 1.134 primary studies were initially identified based on the research inclusion criteria. Through the use of a flow diagram, 7 articles and 21 theses were selected for inclusion in the research. By combining these studies, the total sample size was determined to be 11.797 participants. It is worth noting that the specific findings and conclusions of the included studies were not mentioned in this description. The focus of the research was to gather relevant studies within the specified timeframe and determine the total sample size for the meta-analysis.

Coding Process

A coding form has been created in order to prevent errors in the coding of the studies included in the research and not to ignore the inclusion criteria of the research. Accordingly, the thesis or article type of the studies included in the research were processed into the form as publication type, sample sizes as N, arithmetic mean and standard deviation values as the binary group average difference. An observation was made about whether the same coding was performed using this form in the same way by another researcher. Then, the reliability coefficient between decoders was calculated and the reliability value between decoders was reached [K=.790, t=6.363, p<.05]. This finding showed that the confidence among decoders was high in the axis of inclusion criteria of the research (Landis & Koach, 1977).

Analysis of Data

Considering that the measurement tools included in the meta-analysis for the data analysis of the study were obtained from different scales, the process of standardizing the scores with the Hedges' g coefficient was justified (Leandro, 2005; Sterne, 2009). On the other hand, in the data analysis of the study, the large effect size for the effect size greater than 1, weak effect for effect size less than .20, with .21 the small effect of the effect decoupled among .50, the effect greater than .51 is exhausted according to the reference interval as the medium effect (Kulinskaya, Morgenthaler & Staudte, 2008). Due to the different inclusion criteria of the studies included in the study (Rosenthal, 1987) and the different measurement tools used (Hunter & Schimdt, 2004), the random effects model was used to calculate the effect sizes (Table 6). The data analysis of the research was carried out with the help of CMA (Comprehensive Meta Analysis V4) package program.

FINDINGS

Findings on Publication Bias

In order to assess the presence of publication bias in the meta-analysis study on teachers' perceptions of distance education and technology use proficiency, a funnel plot diagram was constructed. This diagram assists in examining the reliability and validity of publication bias by plotting the standard error values against the effect size of the included studies (Riley, Tierney & Stewart, 2021). The funnel plot diagram for the meta-analysis is presented in Figure 1. The X-axis in Figure 1 represents the effect size, specifically the Hedges's g effect, of the included studies on teachers' perceptions of distance education and technology use competencies. The Y-axis represents the standard errors of the studies included in the meta-analysis. The studies located at the top of the graph are those with larger sample sizes.

Constructing a funnel plot diagram is a commonly used method in meta-analysis studies to evaluate publication bias. It provides an initial visual impression for researchers and allows for calculations related to publication bias. By examining the shape and distribution of the plotted points, researchers can draw conclusions about the potential presence or absence of publication bias. It is important to note that specific findings and conclusions regarding publication bias were not mentioned in this description. The funnel plot diagram was used as a tool to assess publication bias in the meta-analysis study, and further statistical analyses may have been conducted to draw general conclusions (Egger, Higgins & Smith, 2022).

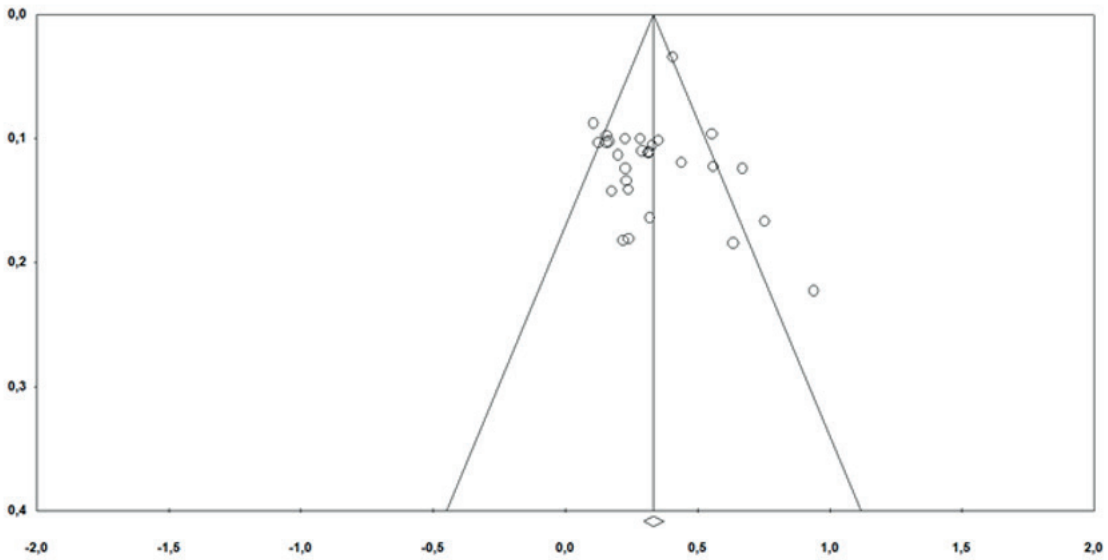


Figure 1. Funnel Plot Diagram of The Effect Sizes and Standard Errors of The Studies Included in The Meta-Analysis

If there is any presence of publication bias in the funnel plot diagram, the plotted points would demonstrate an asymmetrical funnel shape, suggesting the possibility of publication bias (Ellis, 2010). This asymmetry indicates the presence of missing studies in the meta-analysis (Cumming, 2012). However, in the present study, the distributions of the included studies demonstrated a symmetrical distribution, suggesting the absence of publication bias. Nonetheless, to arrive at a definitive conclusion, statistical calculations were conducted in the meta-analysis, as relying solely on the funnel plot diagram is insufficient. The following are the analysis results pertaining to this matter.

Table 1. Rosenthal's Fail-Safe N Results

For Observed researches		Alfa	Z for Alfa	Tails	Observed a number of research	Number of research (p>.05)
Z Value	p Value					
15.702	.001***	.0500	1.959	2.000	28	1770

*Note. *p<.05, **p<.01*

When the results of Rosenthal's fail-safe N method analysis on the publication bias of teachers' perceptions of distance education and the effectiveness of technology use proficiency were examined in Table 1, it was concluded that this study requires at least 1.770 studies with zero or negative direction. The 1959 z value was found by converting the p values for each study to the z value in Rosenthal 's safe N method. The fact that this value is >1 indicates that the meta-analysis results are also robust to future research and that there is no propagation bias in the study. The Begg rank correlation method is a statistical method that uses Kendal's tau rank correlation coefficient to explain the relationship between the order of effect sizes and the order of variances of these sizes (Borenstein et al., 2019). This method is a procedure that quantifies the result of the funnel plot, rather than the researcher-dependent interpretation (Hartung, Knapp & Sinha, 2008).

Table 2. Rank Correlation Analysis Results of Begg and Mazumdar

Kendall Statistics (P-Q)	84.000
Kendall Tau (Number of discordant pairs)	
Tau	.222
z-value (for tau)	1.659
P-value (1-tailed)	.048
P-degeri (2-tailed)	.097
Kendall Tau (Number of concordant pairs)	
Tau	.219
z- value (for tau)	1.639
P- value (1-tailed)	.050
P- value (2-tailed)	.101

*Note. *p<.05, **p<.01*

When the rank correlation analysis results of Begg and Mazumdar were examined in Table 2, it was found that the primary studies included in this meta-analysis study were not selected biased according to the results of the analysis [Tau=.219 p>.05].

Table 3. Orwin's Fail-Safe N Analysis Results

Average effect size of observed studies	.334
The reduction level of the effect size	.00100
Mean effect size of the studies that were not observed	.000
Number of studies needed to achieve a non-significant effect size	9.326

*Note. *p<.05, **p<.01*

The Orwin's fail-safe N analysis, which examines the protection number, provides a method to detect publication bias by considering a predetermined effect size as the criterion, rather than expecting the effect to be exactly zero (Cleophas & Zwinderman, 2017; Rothstein, Sutton & White, 2021). This method aims to determine how many studies with negative or null effects would be needed to reduce the average effect size of the studies included in the meta-analysis to a level determined by the researcher (Cooper, Hedges & Valentine, 2019). In this analysis, the average effect size is treated as a non-zero value for studies that may not have been reported in the literature (Hangji, 2017). Upon examining the results of the Orwin's fail-safe N analysis presented in Table 3, it was found that in order to reduce the average effect size of studies on teachers' perceptions of distance education and the effectiveness of technology use proficiency below 0.05, a total of 9.326 studies with an average effect size of .000 would need to be conducted or disregarded. This suggests that there is no significant publication bias present in this study.

Table 4. Trim and Fill Analysis Results by Duval and Tweedie

Observed Value of Effect Sizes	.323
Adjusted Value of Effect Sizes	.323
Number of Trimmed Studies in Meta-Analysis	000

*Note. *p<.05, **p<.01*

The trim and fill method is an iterative approach that is used to estimate the number of missing studies by assuming symmetry in the data (Cleophas & Zwinderman, 2017). It employs a non-parametric technique to adjust the data and create a more symmetrical funnel plot by estimating the number of studies that may be missing on one side of the graph (Dias et al., 2018; Kulinskaya, Morgenthaler & Staudte, 2008). Upon examining the results of the Duval and Tweedie fill and fill analysis, which aims to correct for publication bias rather than detect its presence, as shown in Table 4, it was found that the average effect size determined for the primary studies was.323. However, when twenty-eight hypothetical studies were added to the analysis, the estimated effect size remained.323. This indicates that there is no significant publication bias present in this meta-analysis study.

Table 5. Egger's Regression Constant Analysis Results

Intercept	**SE**	**df**	**t**	**p**	**LLCI**	**ULCI**
.234	.695	26	.338	.369	-1.663	.338

*Note. *p<.05, **p<.01*

In Egger regression analysis (Harrer et al., 2022), which proposes a linear regression approach to statistically test whether there is any bias in the data included in the meta-analysis, the standard normal deviation is regressed against its precision (Chen & Peace, 2021). In this analysis, the regression line of a research without publication bias is expected to coincide with the line in the center of the funnel plot (Cheung, 2015). If the funnel plot is not symmetrical, the regression line does not pass through the center (Patole, 2021). The application of Egger regression analysis is appropriate if primary studies have different sample sizes and at

least one study has a medium effect size (Schmid, Stijnen & White, 2021). When the regression constant analysis results were examined in Table 5, [t=.369 p>.05, -1.663 & .338] p significance value and this value calculated in the confidence interval fulfilled the p>.05 condition, which showed that there was no publication bias in this meta-analysis study.

Findings on Heterogeneity and Effect Size

After confirming that the general effect size value was not affected by publication bias, the heterogeneity test was conducted to assess the presence and degree of heterogeneity among the primary studies investigating teachers' perceptions of distance education and the effectiveness of technology use competencies. Heterogeneity is an assumption of the random effects model, as stated by Hunter and Schmidt (2004), as the presence of heterogeneity suggests the influence of various moderating factors, and assessing heterogeneity is a fundamental objective of meta-analysis, as noted by Cooper (2017).

In meta-analyses, Q statistics are used to determine the presence of heterogeneity, while I2 statistics are used to estimate the degree of heterogeneity, as explained by Leandro (2005). In this meta-analysis, the significance level for model selection was set at p <.05, with a 95% confidence level, for the statistical values of heterogeneity Q, I^2, and X^2. The analysis aimed to determine whether there were significant differences in heterogeneity levels. The results of the analysis are presented in Table 6.

Table 6. Analysis Results Regarding the Heterogeneity of The Effect Sizes of The Studies Included in The Meta-Analysis

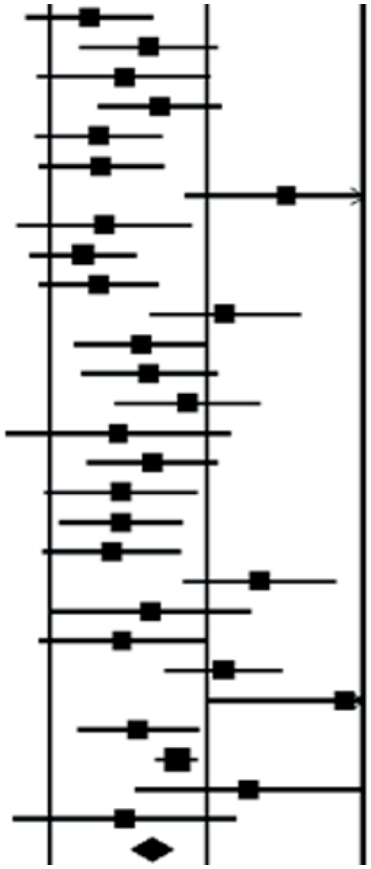
Model Type	ES	df	Q	X^2	SE	I^2	LLCI	ULCI
Random Effects Model	.323	27	63.947	40.11	.032	57.777	.260	.387

*Note. *p<.05, **p<.01 LLCI= Lower Confidence Interval; ULCI= Upper Confidence Interval*

One of the objectives of meta-analysis studies is to examine heterogeneity, which considers the possibility that the intervention's effect may vary across different sample subgroups or, in the case of observational studies, the effect of exposure may differ among individuals, as described by Hedges and Olkin (1985). Heterogeneity is related to the weights assigned to the studies and influences the choice between fixed effects and random effects models, as discussed by Littell, Corcoran, and Pillai (2008). Heterogeneity plays a crucial role in determining the differences between the results of these models, as mentioned by Card (2012). The Cochran Q statistics significance test is used to assess heterogeneity, indicating whether the studies share a common effect size (p<0.05). If the distribution of effect sizes is heterogeneous, it suggests that there are influential moderator variables at play, as explained by Lipsey and Wilson (2001). The analysis results regarding the heterogeneity of the effect sizes of the studies included in the meta-analysis are presented in Table 6, while the effect sizes and overall effects are shown in Table 7. Descriptive statistical analysis results of the variance values, lower and upper confidence intervals, z-values, and significance values of the included studies are provided in Table 8. Examining the heterogeneity analysis results in Table 6, a Q value of 63.947 was obtained. This value exceeded the chi-square value (X^2=40.11) corresponding to the degrees of freedom (df=27), indicating that the effect sizes exhibited a heterogeneous distribution according to the random effects model. The Higgins I^2 parameter represents the proportion of true heterogeneity to the total observed variance (Khan, 2020). It indicates the level of inconsistency between the confidence intervals, regardless of the location or spread of the true effects (Simske, 2019). Therefore, I^2 is more appropriately viewed as a measure of inconsistency among study findings rather than a measure of heterogeneity among actual effects (Rosenthal, 1987). It quantifies the percentage of variability in effect estimates attributable to heterogeneity rather than sampling error and is not directly affected by the number of studies in the analysis (Sterne, 2009).

Table 7. Overall Effect Sizes of The Studies Included in The Meta-Analysis

Name of the Study	Hedges's g	Standard Error	Hedges's g & Confidence Interval
Akman, 2021	.126	.103	
Aksoy et al., 2021	.315	.112	
Arabaci, 2021	.238	.141	
Bingol, 2022	.352	.102	
Cetin, 2022	.156	.103	
Cok, 2021	.165	.103	
Dolek, 2022	.754	.167	
Donmez, 2021	.176	.143	
Duzgun, 2022	.105	.088	
Elyildirim, 2022	.156	.098	
Gokce, 2022	.559	.123	
Guney, 2021	.291	.110	
Kilic, 2022	.317	.111	
Kiraz, 2021	.440	.119	
Kokosmanli, 2022	.219	.182	
Kosan, 2022	.328	.106	
Kurd et al., 2022	.228	.124	
Kurnaz et al., 2020	.227	.100	
Kuru, 2022	.198	.113	
Ozcan & Sarac, 2020	.669	.124	
Shaikh, 2021	.320	.164	
Soydan, 2021	.231	.134	
Toptas, 2022	.554	.097	
Ulus, 2022	.941	.223	
Ulutas, 2022	.283	.100	
Yilmaz & Toker, 2022	.406	.034	
Yilmaz, 2022	.635	.184	
Yumbul, 2021	.239	.181	
General Effect Size	**.323**	**.032**	



P.S. The leftmost vertical line "0.00" the middle vertical line "0.50" the rightmost vertical line "1.00" constitute the reference intervals. An I^2 value of 0% indicates that the variability is due to sampling error or chance, and closer to 100% indicates that the variability is largely due to the actual heterogeneity between studies (Stangl & Berry, 2000). The analysis of the effect sizes of the studies included in the meta-analysis revealed a high level of heterogeneity, with an I^2 value of 57.777%. This indicates that 57.777% of the observed variance can be attributed to actual differences between the studies and may be potentially explained by covariates at the study level (Zoccai, 2018). This finding aligns with previous research on the subject, which also highlighted a significant level of heterogeneity (Cleophas & Zwinderman, 2017). Based on these results, the random effects model was selected to estimate the effect size in this study. The effect size is a crucial piece of information that can be derived from the studies included in a meta-analysis (Riley, Tierney & Stewart, 2021). Therefore, it is essential to calculate the effect size based on the reported results. Reporting a measure of the absolute magnitude of the effect is recommended when the intervention's effect is deemed significant in hypothesis testing, as it provides an indication of the overall impact (Egger, Higgins & Smith, 2022). The effect size is a statistical value that indicates the extent to which the results obtained from the

sample deviate from the expectations defined in the null hypothesis (Borenstein et al., 2019). Additionally, it also expresses the effectiveness of the practice under investigation, regardless of the number of individuals involved (Rothstein, Sutton & White, 2021).

Table 8. Descriptive Statistical Analysis Results of The Studies Included in The Meta-Analysis

Name of the Study	Varyans	LLCI	ULCI	z	p	Study Weight
Akman, 2021	.011	-.077	.329	1.218	.223	4.08
Aksoy et al., 2021	.012	.096	.534	2.822	.005*	3.82
Arabaci, 2021	.020	-.039	.515	1.685	.092	3.00
Bingol, 2022	.010	.152	.551	3.456	.001	4.14
Cetin, 2022	.011	-.047	.358	1.508	.132	4.09
Cok, 2021	.011	-.036	.366	1.605	.108	4.11
Dolek, 2022	.028	.428	1.081	4.521	.001**	2.45
Donmez, 2021	.020	-.104	.455	1.231	.218	2.97
Duzgun, 2022	.008	-.067	.278	1.198	.231	4.62
Elyildirim, 2022	.010	-.036	.348	1.593	.111	4.27
Gokce, 2022	.015	.319	.800	4.553	.001**	3.49
Guney, 2021	.012	.075	.507	2.640	.008*	3.87
Kilic, 2022	.012	.100	.534	2.862	.004*	3.85
Kiraz, 2021	.014	.206	.674	3.682	.001**	3.59
Kokosmanli, 2022	.033	-.139	.576	1.200	.230	2.18
Kosan, 2022	.011	.121	.535	3.099	.002*	4.01
Kurd et al., 2022	.015	-.016	.471	1.830	.067	3.44
Kurnaz et al., 2020	.010	.030	.424	2.260	.024*	4.18
Kuru, 2022	.013	-.024	.421	1.749	.080	3.76
Ozcan & Sarac, 2020	.015	.426	.913	5.384	.001**	3.45
Shaikh, 2021	.027	-.002	.641	1.950	.051	2.50
Soydan, 2021	.018	-.032	.494	1.721	.085	3.18
Toptas, 2022	.009	.365	.744	5.734	.001**	4.31
Ulus, 2022	.050	.504	1.377	4.220	.001**	1.62
Ulutas, 2022	.010	.087	.479	2.825	.005*	4.19
Yilmaz & Toker, 2022	.001	.338	.473	11.774	.001**	6.48
Yilmaz, 2022	.034	.274	.997	3.443	.001**	2.14
Yumbul, 2021	.033	-.116	.594	1.322	.186	2.20
General Result	**.001**	**.260**	**.387**	**9.979**	**.001****	

*Note. *p<.05, **p<.01 LLCI= Lower Confidence Interval; ULCI= Upper Confidence Interval*

When examining the effect sizes and overall effects of the studies included in the meta-analysis, Table 7 presents a range of effect sizes from the lowest value of 0.105 to the highest value of 0.941. These effect sizes represent the estimated effects in the population and indicate the magnitude of the observed relationship between teachers' perceptions of distance education and the effectiveness of their technology use competencies. Based on reference intervals, an effect size below 0.20 is considered weak, between 0.20 and 0.50 is considered small, between 0.51 and 1.0 is considered medium, and above 1.0 is considered large (Cooper, Hedges & Valentine, 2019). In this meta-analysis, the effect sizes indicated a small but positive effect. Table 8 provides the results of the descriptive statistical analysis of the studies included in the meta-analysis, indicating their significance at the 95% confidence interval and a significance level of 0.05. The calculated z-values for each study (Aksoy et al., 2021; Dolek, 2022; Gokce, 2022; Kiraz, 2021; Kosan, 2022; Kurnaz et al., Ozcan &

Sarac, 2020; Toptas, 2022; Ulus, 2022; Ulutas, 2022; Yilmaz & Toker, 2022; Yilmaz, 2021) demonstrate the statistical significance of the individual studies. The overall variance was 0.001, with a lower confidence interval of 0.260, upper confidence interval of 0.387, z-value of 9.979, and a p-value of 0.001**, indicating that all studies included in the meta-analysis yielded significant results. The weights assigned to the studies ranged from 1.62% to 6.48%, suggesting a relatively balanced contribution from each study considering the analysis results from Tables 6, 7, and 8, it can be concluded that the hypothesis *"H1: The effect size of teachers' perceptions of distance education and technology use proficiency is positive"* is supported. Furthermore, the presence of high heterogeneity suggests the involvement of moderator variables in the meta-analysis studies. In this meta-analysis, the type of publication, type of school, and teachers' industry variables were identified as potential moderators, and further calculations were conducted accordingly.

Findings Related to Moderator Analysis

The results of the moderator analysis, presented in Table 9, examined the effect of publication type, school type, and teachers' branches on the effect size related to teachers' perceptions of distance education and the effectiveness of technology use proficiency. A heterogeneity value of Q_b = 0.055 was obtained for the included studies. This value was compared to the chi-square statistical value [df=1, 3.84] based on the degrees of freedom and significance level. Since the obtained heterogeneity value was greater than the critical chi-square value, it indicated that the publication type variable was not statistically significant in the meta-analysis studies [p=0.814]. In other words, the effect size of teachers' perceptions of distance education and technology use competencies did not differ significantly based on the publication type, whether it was an article [ES=.336] or a thesis [ES=.319]. However, it was observed that studies published as articles had a slightly larger effect size. Therefore, the publication type variable did not act as a moderator in the effect size of teachers' perceptions of distance education and the effectiveness of technology use competencies. This finding suggests that the hypothesis "*H_2: Publication type variable plays a moderator role in the effect size of teachers' perceptions of distance education and technology use proficiency"* was not supported.

Table 9. Moderator Analysis Results

Variables	Q_b	df	p	X^2	N	ES	LLCI	ULCI
Publication Type	**.055**	**1**	**.814**	**3.84**				
Article					7	.336	.213	.459
Thesis					21	.319	.241	.396
School Type	**1.374**	**2**	**.503**	**5.99**				
Primary school					12	.339	.253	.425
Middle School					7	.270	.165	.376
Secondary education					9	.365	.209	.521
Branch	**10.548**	**7**	**.160**	**14.07**				
Physical education					3	.359	.077	.641
Religious Culture and Moral Knowledge					2	.167	.012	.323
Science					7	.365	.220	.510
English					3	.392	.329	.456
Maths					2	.568	-.119	1.255
Music					2	.400	.078	.721
Pre-school					2	.228	.071	.385
Class Teacher					7	.291	.163	.419

*Note. *p<.05, **p<.01 LLCI= Lower Confidence Interval; ULCI= Upper Confidence Interval*

The heterogeneity value for the included studies was calculated as Q_b=1.374, which corresponds to a chi-square statistical value [df=2, 5.99] based on the specific degrees of freedom and significance level. The result indicates that the significance of the school type variable in the meta-analysis is not statistically significant [p=.503]. In simpler terms, teachers' perceptions of distance education did not lead to a significant difference in the effect size of their technology use competencies across primary school [ES=.339], secondary school [ES=.270], or secondary education [ES=.365]. However, it is worth noting that the effect size of studies conducted in secondary education institutions was relatively larger. Therefore, the school type variable does not play a moderator role in the relationship between teachers' perceptions of distance education and their effectiveness in using technology. Based on these findings, the hypothesis stating that "*H_3= Type of school variable plays a moderator role in the effect size of teachers' perceptions of distance education and technology use proficiency" was not supported.*

On the other hand, the studies included in the analysis had a heterogeneity value of Q_b=10.548. This value corresponds to a chi-square statistical value [df=7, 14.07] based on a certain degree of freedom and significance level. The fact that the observed heterogeneity value exceeds the expected value indicates that the significance of the teachers' branch variable is not statistically significant in the meta-analysis [p=.160]. In simpler terms, the effect size of teachers' perceptions of distance education and technology use competencies did not differ significantly across different branches, including Physical Education [ES=.359], Religious Culture and Moral Knowledge [ES=.167], Science [ES=.365], English [ES=.392], Mathematics [ES=.568], Music [ES=.400], Preschool [ES=.228], or Classroom Teacher [ES=.291]. However, it is noteworthy that the effect size of studies focusing on mathematics teachers was relatively larger. As a result, the branch variable does not act as a moderator in the relationship between teachers' perceptions of distance education and their effectiveness in using technology. These findings indicate that the hypothesis stating "*H_4= Branch variable plays a moderator role in the effect size of teachers' perceptions of distance education and technology use proficiency" was not supported.*

DISCUSSIONS AND CONCLUSION

Researchers sometimes choose not to publish non-significant results, leading to a potential bias in the published literature (Riley, Tierney & Stewart, 2021). Consequently, relying solely on reviews of published studies may result in biased conclusions (Cooper, Hedges & Valentine, 2019). Therefore, it is essential to assess whether there is publication bias in meta-analysis studies through appropriate statistical calculations. In this study, a funnel plot was constructed to investigate publication bias, and various methods such as rank correlation, trimming and filling, regression constant, and the N method were employed. Upon careful examination of the funnel plot, it was observed that the distribution of studies included in the meta-analysis exhibited a symmetrical pattern without any significant asymmetry. An asymmetrical funnel shape would indicate potential publication bias (Rothstein, Sutton & White, 2021). However, it should be noted that the funnel plot alone is not sufficient to draw conclusions in meta-analysis studies, particularly for larger studies (Borenstein et al., 2019). The calculated z-value in Rosenthal's fail-safe N method, which determines the number of studies needed to nullify the observed effect, was greater than a critical value, suggesting that the meta-analysis was robust against publication bias. The Tau value calculated in the Begg rank correlation method was not significant, indicating that the studies included in the meta-analysis were not selectively biased. Additionally, Orwin's fail-safe N analysis was conducted to estimate the number of studies with opposite effects required to nullify the results. Based on the analysis, it was concluded that there was no publication bias. Furthermore, the effect size value obtained from the trim and fill method closely aligned with the corrected effect size value. Considering these findings collectively, it can be concluded that the published studies on the relationship between teachers' perceptions of distance education and their technology use competencies were selected and included in the meta-analysis according to predefined criteria without significant publication bias.

The review period for publication of this research was set from March 1, 2022, to September 30, 2022, and it was intentionally kept long due to the extensive number of studies available on the subject. However, one of the main limitations of meta-analysis studies is that highly researched topics may not be investigated globally or cover long periods of time (Egger, Higgins & Smith, 2022; Harrer et al., 2022; Riley, Tierney

& Stewart, 2021; Rothstein, Sutton & White, 2021; Schmid, Stijnen & White, 2021). To address this concern, a comprehensive literature search was conducted using predefined keywords, resulting in the retrieval of tens of thousands of studies. Due to practical constraints such as time and budget limitations, the sample for this research was limited to studies conducted in Turkiye. The effect size of the studies examining teachers' perceptions of distance education and their technology use competencies in the Turkish sample was found to be small but positive. In other words, the primary studies indicated a small but positive effect on teachers' perceptions of distance education and their proficiency in using technology. This finding aligns with previous studies on the topic (Alghamdi et al., 2020; Ali, 2020; Burac et al., 2019; Cachero-Gonzalez et al., 2019; Celik et al., 2022; Elizabeth Noor Coutts et al., 2020; Fis Erumit et al., 2021; Goncalves et al., 2020; Gorghiu et al., 2021; Grabinski et al., 2020; Hamann et al., 2020; Makamure & Tsakeni, 2020; Makokotlela, 2022; Mnguni & Mokiwa, 2020).

In this study, the goal was to investigate teachers' perceptions of distance learning and the effectiveness of their technology use skills. Since the included studies in the meta-analysis provided estimates on different scales (Sterne, 2009), the effect sizes were calculated using the Hedges g coefficient and standardization of effect sizes (Leandro, 2005). Based on the analysis results of Q, I2, and X2 values, it was decided to interpret the studies using the random effects model. The type of publication, type of school, and teachers' branches were identified as potential sources of heterogeneity. However, the analyses revealed that these factors did not significantly influence teachers' perceptions of distance education and their proficiency in using technology.

This research aimed to investigate the effect size of teachers' perceptions of distance education and their technology use competencies using the meta-analysis method. To achieve this, primary studies published between 2020-2022 in databases such as the Council of Higher Education National Thesis Center, Dergi Park, Tr Index, Turkish Education Index, and Academic Directory were analyzed. The keywords used to retrieve relevant studies were "distance education," "teachers' perceptions of distance education," and "teachers' technology usage competencies." Publication bias is a common concern in meta-analysis studies. To address this, several methods were employed in this study, including the use of a funnel plot diagram, rank correlation, trim and fill analysis, fail-safe N numbers, and regression constant values. Through these calculations, it was determined that there was no evidence of publication bias in the primary studies included in the analysis of teachers' perceptions of distance education and their technology use competencies.

Furthermore, Q statistics were utilized to assess heterogeneity in the meta-analyses, and Q, I^2, and X^2 statistics were calculated to determine the extent of heterogeneity and select the appropriate model. Based on the calculations, it was determined that the research should be reported using the random effects model. The effect size of teachers' perceptions regarding distance education and technology use competencies was found to be positive. This outcome provided support for the hypothesis that *"H_1: The effect size of teachers' perceptions of distance education and technology use proficiency is positive*." Publication type, school type, and teachers' branch were selected as moderators to investigate potential sources of heterogeneity. However, the p-value associated with the moderator variable of publication type did not reach statistical significance. Therefore, it was concluded that publication type did not have a moderating effect on the relationship between teachers' perceptions of distance education and their proficiency in technology use. As a result, the hypothesis stating that "*H_2: Publication type variable moderates the relationship between teachers' perceptions of distance education and technology use proficiency" was not supported.* Similarly, the p-value for the school type variable, included as another moderator, was not statistically significant. Hence, it was determined that school type did not play a moderating role in the relationship between teachers' perceptions of distance education and their effectiveness in technology use. This finding indicated that the hypothesis stating that "*H_3: Type of school variable moderates the relationship between teachers' perceptions of distance education and technology use proficiency" was not supported.* Furthermore, the p-value associated with the branch variable of the teachers, also included as a moderator, was not statistically significant. Therefore, it was concluded that the branch variable did not act as a moderator in the relationship between teachers' perceptions of distance education and their proficiency in technology use. Consequently, the hypothesis stating that "*H_4: Branch variable moderates the relationship between teachers' perceptions of distance education and technology use proficiency" was not supported.*

Based on the analysis of the effectiveness of research on teachers' perception of distance education and their competencies in technology use, the following recommendations are proposed for teachers, educational administrators, stakeholders, decision-makers, and researchers:

Research Recommendations

- The perception level of teachers towards distance education should be increased and necessary studies should be carried out by the ministries of education for the development of teachers towards distance education.
- Necessary in-service trainings should be given on the technology use competencies of teachers and the necessary support should be provided by the relevant education ministries or relevant education stakeholders for teachers to use technology effectively.

Recommendations for Researchers

- With this research, a meta-analysis study was conducted to determine the effect size of primary studies on teachers' perceptions of distance education and their technology use competencies. A meta-synthesis or systematic review study in qualitative systematic analysis design can be planned for interpreting the studies on this subject.

Acknowledgments: The author would like to thank Prof. Dr. Ilhan Gunbayi from the University of Akdeniz for critical reading and language editing.

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VIRTUAL SIGN LANGUAGE INTERPRETATIONS IN OPEN AND DISTANCE EDUCATION: A PROBE INTO 'ENABLERS' AND 'CONSTRAINTS'

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Received: 15/06/2023 **Accepted:** 17/09/2023

ABSTRACT

In line with the philosophy of inclusion and various legislative instruments which encourage 'education for all', ODL institutions have made provision for sign language interpreters (SLIs) to facilitate participation for deaf students. Although, some studies have examined issues of virtual learning and the ODL programme; a paucity of studies assessing virtual sign language interpretation (VSLI) in remote educational activities is evident. Therefore, a research study was instituted to probe into perceived enablers and or constraints of providing VSLI during the Covid-19 lockdown in Nigeria. Based on the Job Demand Resources Model, two research questions were raised and answered in this paper. This study adopted the qualitative research design and seven SLIs who had participated in virtual teaching and learning activities during the lockdown were purposively selected to participate in the study. Semi-structured interviews were used for data collection, and the data collected were coded and analysed thematically through using an iterative process. Government policies and the empathetic nature of SLIs were found to be enablers of VSLI, while four themes, namely epileptic power supply; internet connectivity; lack of institutional support and the comprehensibility of deaf students who attended remote lectures were found to serve as barriers to effective and efficient VSLI. Based on the findings, appropriate recommendations were made.

Keywords: Virtual sign language interpretation, sign language interpreters, open and distance education, deaf students, online learning, Covid-19.

INTRODUCTION

For more than three decades, open and distance learning has continually evolved based on the need of learners and changes in various means of education deliverables such as through correspondence (Bower & Hardy, 2004; Caruth & Caruth, 2013) or through digital means (Sari & Nayir, 2020). Distance education is described in this study as a form of teaching and learning process whereby the teacher/tutor/facilitator or lecturer, as the case may be, is far away from the student(s) while communicating ideas, knowledge or educational instructions through various means, such as correspondence and other audio-visual means (radio, television and or internet-enabled computers). The foregoing implies that in distance education both the instructor and students are physically apart (Mdakane, Ngubane, & Dhlamini, 2022; Pregowska, Masztalerz, Garlinska & Osial, 2021), while communication between them is modulated through media agreed on. According to Adigun (2022); Shahabadi and Uplane (2015), distance education can be achieved either through synchronous (real-time) and/or asynchronous (recorded) models. In the current study, open and distance education was construed to mean virtually interpreted university lectures with deaf students as participants.

Interestingly, prior to the emergence of Covid-19, both models (synchronous and asynchronous) had been fully deployed in open and distance learning globally. However, the advent of Covid-19 further encouraged the application of technologies for the continuation of instructional deliveries (Adigun, 2022) to all students, irrespective of the mode of learning they had registered pre-Covid-19. In other words, all learners, those with disabilities and without disabilities, had been compelled to participate in remote education during the Covid-19 lockdowns (Adigun, 2022; Adigun, Nzima, Maphalala, & Ndwandwe, 2022). Hence, despite their loss in the sense of hearing and limited opportunities for incidental learning, deaf students participated in remote teaching and learning processes through internet-enabled devices. For the purpose of this study, deaf students represent those students with varying degrees of hearing loss whose hearing disabilities become evident when there is need for two-way verbal communication. In other words, their sense of hearing is non-functional to perceive auditory signals; and they therefore communicate through sign language (SL). Adigun (2019) asserts that sign language (SL) is a visual-spatial language which makes use of a combination of facial expressions, body movements and gestures to communicate ideas, feelings and emotions among deaf people and between deaf and non-deaf people. As a visual-gestural modality-enhanced language, sign language relies on combining hand and facial movements around the upper torso. While the deaf actively utilise sign language, some non-deaf individuals have learnt the art of signing and are certified sign language interpreters (SLIs) who serve as conduits for exchanging oral information between deaf and non-deaf people who do not use or understand sign language (Adigun, 2019).

Since the population of deaf students at higher education sector, is rapidly increasing (Mitchell & Karchmer, 2006), inclusive educational policies have enforced the employment of SLIs who serve to interpret lectures to deaf students during various university or college teachings (Marschark, Sapere, Convertino, & Seewagen, 2005; Napier, 2004). Some existing studies have shown that SLIs in educational spaces are constantly faced with various endemic challenges which include, but are not limited to, controversial role issues in the workplace to the sociolinguistic view of deaf students (Hale, Valero Garces & Martin, 2008; Witter-Merithew, 1999); the value placed on sign language interpreting profession; (Adigun, 2019; Hall, Hall, & Caselli, 2019), vicarious trauma; (Kilpatrick, 2016) and musculoskeletal diseases and mental health challenges experienced by SLIs (Adigun, 2019; Jimenez-Arberas & Diez, 2022; Napier, Skinner, & Turner, 2017). Conversely, since scanty research evidence on educational sign language interpreting has emerged from Nigeria, this study was aimed at the following:

- To assess 'enablers' and 'constraints' of virtual sign language interpretations (VSLI) in open and distance education as it occurred during the Covid-19 lockdown in Nigeria.

Research Question

The overarching research question of this study was:

What are the **(i)** enablers and **(ii)** constraints of VSLI during the Covid-19 lockdown in Nigeria?

LITERATURE REVIEW

Sign Language Interpretation in Nigeria: Situation Report

Sign language interpretation in Nigeria has a long-standing history like the history of the deaf in Nigeria. In other words, it is difficult to separate the history of SL in Nigeria from the history of deaf education. The population of deaf people in Nigeria comprising about 10 million, (Adigun et al., 2022; Mba, 1995; Treat, 2016) have developed and used the Nigeria SL to communicate with one another. Although, there is an extended variation in SL used by deaf people in Nigeria, the variation is informed by language and cultural differences of the three major ethnic groups in Nigeria: Hausa, Igbo, and Yoruba (Gbolahan, Osinaike, Udoye & Olawole, 2019) and that of about 250 other minor ethnic groups in the country (Asonye, Emma-Asonye & Edward, 2018). Regrettably, despite the huge population of deaf people in Nigeria, there is still not an established sign language interpreter training institution that provides accreditation for professional SLIs. While there are few post-secondary institutions training professionals for persons with special needs (Adigun, Hlongwane & Isaiah, 2021; Eni-Olorunda, 2005), there is not a single institution that awards

a degree or diploma certificates in SL interpretation studies, only deaf education. Powell (2013) echoed a similar situation in New Zealand of "no interpreter-training program focused on the post-secondary level exists in New Zealand".

Over the years, graduates of deaf education at various Nigerian institutions of higher learning and or families/friends of the deaf have developed and used sign language for communication purposes. The foregoing is further expressed by two different associations of sign language interpreters in the country: (i) the Association of Sign Language Interpreters of Nigeria (ASLIN; https://aslin.org.ng/), and (ii) the Educational Sign Language Interpreters Association of Nigeria (ESLIAN; https://eslian.org/default.aspx#home). The foregoing implies that while higher educational institutions in Nigeria have appointed sign language interpreters for deaf students, the criteria for such appointments have always been a degree or certificate in deaf education. While SLIs in Nigeria had no regulated SLI certification, they have constantly developed their interpretation skills through extended communication and interactions with deaf people who sign, using a mixture of American and Nigerian Sign Language.

Virtual Sign Language Interpretation During Covid-19: Enablers and Constraints

Although, receiving SL communication via digital media, such as television, has long been in existence prior to the emergence of Covid-19 (Adigun, Mosia, & Olujie, 2022; Gokce, 2018), receiving SL-interpreted lectures through internet-enabled computerized devices was a new and sudden phenomenon experienced by many Nigerian deaf students in higher education spaces during the Covid-19 pandemic. However, while lectures continued remotely during the pandemic as a measure to curtail the spread of Covid-19, deaf students were encouraged to join virtual (synchronous and asynchronous) classes which were mostly conducted through video-enhanced internet-enabled platforms such as 'Google Classroom', 'Google Meet', 'MS Teams', 'Skype', 'Webex' and 'Zoom' among others (Adigun, 2022; Alshawabkeh, Woolsey & Kharbat, 2021; Williams, 2021). Available evidence showed that, due to restrictions to physical interaction, there was a spike in the adoption and usage of Zoom for academic activities and other engagements (Williams, 2021). Interestingly, the introduction of sign language-enabled features on Zoom increased its use for academic engagements and remote discussions that involve deaf people and contributed to the deaf community increasingly using Zoom (See figure 1). In other words, online academic engagements further involved the use of virtual remote sign language interpretation (McKibbin, 2021)

Figure 1: Picture-in-picture of a female Chinese Sign Language Interpreter interpreting during a Zoom meeting. (Source: https://support.zoom.us, 2023).

While many existing studies lauded the remote continuation of academic sessions (Lynn et al., 2020), other researchers affirmed that remote education, especially for students with disabilities, was equally challenging for both students and facilitators, such as lecturers and SLIs (Adigun et al., 2022; Mathews, Cadwell, O'Boyle, & Dunne, 2022; Safirista, Murtadlo, & Pudjisartinah, 2022). In their study, Alqraini & Alasim (2021), Lynn et al. (2020) remarked that active participation and the enrolment of deaf students in distance education has increased since the emergence of Covid-19. Although Lynn et al. (2020) agreed that deaf students have diversified communication preferences or a style with uneven digital literacy skills, a swift transition to online classes have fostered the digital dexterities of not only the students, but also that of faculty members and support staff, such as SLIs. Online learning during the period of lockdown motivated institutional commitments to the development of various learning management systems that promote real-time learning engagements (Newbold, 2018; Lynn et al., 2020). As indicated by Lynn et al. (2020) deaf students have expanded access to real-time sign language interpretation of lecture series through the Zoom screen-sharing features. In other words, SLIs are virtually available to assist deaf students during remote classroom instructions. In fact, a study by Lynn et al. (2020) revealed that during Covid-19 lockdowns remote teaching, SLIs at the National Technical Institute for the Deaf (NTID) were assigned a window on the learning interface which gave deaf students clear access and visibility to interpreted lectures.

Besides the prevention of local transmission of Covid-19 and stakeholders' efforts of limiting the rate of exclusion of students with disabilities during remote/distance education during the pandemic, Studies affirmed that teachers of deaf students and other relevant professionals, such as SLIs, struggled with various challenges in ensuring effective inclusiveness of education for all (Adigun, 2022; Adigun & Ntokoza, 2022; Alqraini & Alasim, 2021; Alshawabkeh et al., 2021; Baroni & Lazzari, 2020; McKibbin, 2021; Safirista et al., 2022). Although, there is a dearth of research evidence of SLIs who interpreted remotely during Covid-19, there are a few available studies, such as De Meulder, Pouliot and Gebruers (2021), Halley, Wessling and Sargent (2022) and McKibbin (2021). De Meulder, Pouliot, and Gebruers (2021) in their multi-country study of remote SL interpreting during the pandemic, revealed that Zoom was one of the most frequently used platforms among various video-conferencing platforms.

Studies by De Meulder et al. (2021) and McKibbin (2021) revealed that virtual SL interpretation was a new engagement for many of their respondents. According to De Meulder et al. (2021) and McKibbin (2021), many SLIs were compelled to engage in remote SL interpretation. Unfortunately though, the academic community and everyone in general was not prepared to witness a quarantine period of such a magnitude. Hence, SLIs had limited support systems and technical capacities to actively and efficiently discharge their duties remotely. Adigun (2019) stresses the negative impact of the lack of training and re-training of SLIs, especially those SLIs who work in the educational system. As stated by Adigun (2019), the duties of SLIs are associated with extended levels of job stress, burnout and ergonomic hazards. In support of Kumar, Saini, Roy and Dogra (2018), Qin, Cheng, Tang and Bian (2014) as well as Schwenke et al. (2014), Adigun (2019) further echoed the potential negative effect of job pressure; and the mismatch between working conditions and training. Unfortunately, published evidence among SLIs who interpreted remotely showed that SLIs were overwhelmed with remote interpreting jobs and how to cope with the demands of families at home (Alqraini & Alasim, 2021; De Meulder et al., 2021, Halley et al., 2022; McKibbin, 2021).

Previous studies revealed that faculty members/academics/support staff members, especially those from some African nations, lack sufficient potential for web-based pedagogies and their usability of video-conferencing platforms is not optimal (Maphalala & Adigun, 2021; Panyukova & Sergeeva, 2019; Sife et al., 2007). Among some stated challenges to effective and efficient two-way interaction via video-conferencing tools, Maphalala and Adigun (2021); Halley et al. (2022); Koustriava (2022), and McKibbin (2021) aver that not only students experience technical difficulties in using various internet-enabled devices for virtual learning. In fact, De Meulder et al. (2021); Maphalala and Adigun (2021) and McKibbin (2021) expressively indicated that faculty members and other e-learning facilitators at various times indicated extensive challenges with technical glitches, and most of the times there was no immediate technical support. Lamentably, a volume of other studies has shown that remote education in the African sub-region is greatly hampered by epileptic power supply and unreliable internet connectivity. Although SLIs who participated in the studies of De Meulder et al. (2021), Halley et al. (2022) and McKibbin (2021) did not complain about electricity challenges, they were overwhelmed by financial challenges; and many indicated a lack of suitable workplace and equipment as well as technical glitches.

Alsadoon and Turkestani (2020), as well as Alqraini and Alasim (2021) alluded those professionals working with deaf students were discouraged by language competencies of deaf students and their potential to comprehend academic instructions during remote/virtual teaching and learning sessions. Alqraini and Alasim (2021) noted that deaf children's interest in learning is diminished during remote learning due to a lack of adequate comprehension. In fact, Williams (2021) and Lynn et al. (2020) asserted that deaf students are highly susceptible to 'Zoom' fatigue during remote interpreting sessions. Lamentably, despite the 'high' population of deaf people in Nigeria, their academic engagements were greatly affected during the pandemic (Adigun et al., 2022). It is quite disappointing that there is yet empirical evidence on sign language interpretation for deaf students during the lockdown in Nigeria. Therefore, it is believed that the current study which explored the 'enablers' and 'constraints' of VSLI in open and distance education, as it occurred during the Covid-19 lockdowns in Nigeria, will not only provide new knowledge in remote sign language interpretation, but will also enhance professional development of sign language interpretation globally.

THEORETICAL FRAMEWORK

The Jobs Demands Resources Model (JD-R) by Dean and Pollard (2001) is used to frame this study. JD-R assume that there are two distinctive job characteristics: job demands (physical and psychological demands); and job resources (functional factors/variables that aid the smooth transition of an employee towards an overall achievement of organizational goals) in every context of work (physical or remote). Demerouti and Bakker (2022) have drawn the attention of research on the implication of JD-R for understanding employees SLIs, in this case, can best deal with the traumatizing impact of the pandemic and how they are coping with other workplace crises which may arise from resources to aid effective functionality. According to Adigun (2019), the schedule of SLIs is so demanding that it has a negative impact on their mental health. Adigun (2019; 2020) and Powell (2013) assert that SLIs are prone to job stress and burnout, even during face-to-face interpreting. They work under pressure to keep up with the speaker while ensuring that their deaf client does not miss out on any slight information. In other words, their job control ability is minimal since their functionality is dependent on the speed at which the speaker speaks and or clarity of the speakers' speech. Regrettably, it is assumed that while SLIs may have significant challenges when interpreting in a face-to-face meeting, virtual interpreting may exert more pressure on SLIs. It is assumed that resources required for their job and the perceived inadequacy of comprehensibility of their client may increase the apprehension of SLIs interpreting virtually during the Covid -19 lockdowns.

METHOD

Study Design and Setting

This study adopted a qualitative research design, using the interpretive paradigm to explore enablers and constraints of virtual sign language interpretation in open and distance education in Nigeria. The qualitative research design was considered appropriate mainly because the research design allows for the exploration of phenomena in its natural environment. According to Astalin (2013), such research design provides a researcher with the opportunity of dealing with research concerns based on aspirations, attitudes, beliefs, motives and values in relation to physical and social interactions. Also, we adopted the qualitative research design and the interpretive paradigm because of its strength through a systematic inquiry method to provide an understanding of phenomenological concepts as advanced by Adigun and Mngomezulu (2020), and Creswell (2013). In this study, virtual sign language interpretation in Open and Distance Education was the phenomenon of interest.

Two publicly funded institutions of higher learning from Oyo State, Nigeria were purposively selected for the study. The two institutions were purposively selected based on the availability of deaf students and sign language interpreters who participated in remote teaching/sign language interpretation during the Covid-19 pandemic. The study sampled seven SLIs who engaged in online sign language interpretation to deaf students, using a purposive sampling procedure. The recruitment of study participants was conducted through WhatsApp messaging and telephone calls. Participants who met the inclusion criteria of this study were those who:

- were members of the Educational Sign Language Interpreters Association of Nigeria (ESLIAN);
- were permanent staff of the institution with at least five years of work experience;
- were willing to voluntarily participate in the study.

Data Collection

An interview guide was developed by the researchers for the purpose of data collection. The interview guide covers some semi-structured interview questions such as:

- Have you engaged in VSLI prior to the lockdowns occasioned by COVID-19?
- Did you receive any training from your institution prior to VSLI engagements?
- Did you receive any support from your institution toward the VSLI during the lockdowns?
- If yes, what kind of support?
- How long have you been in the Sign Language interpreting profession?
- How would you describe your experience of virtual sign language interpretation (VSLI)?
- What are the opportunities presented by VSLI?
- What are the potential challenges presented by VSLI?

Data collection was further conducted through semi-structured voice-recorded telephonic interviews with each participating SLI between 21 August 2022 and 17 September 2022. Owing to the lockdown during the time of data collection, the authors were not able to have a face-to-face interview, but the researcher ensured flexibility of questioning and responses during the interview process in line with qualitative research interview protocol (Cohen et al., 2011: 201). In other words, the interviewer allowed a free flow of interview session as respondents were given ample opportunities for expression. Each interview session lasted for about 30 minutes.

Data Analysis

A transcription of the audio-recorded, semi-structured interview was conducted, using Microsoft Word. The transcription was done verbatim by two different translators employed by the researchers. The transcribed document was checked and rechecked alongside with the audio-recorded, semi-structured interview after which the transcript was systematically coded to ensure the anonymity of the study participants. Participant identities were anonymized by using pseudonyms, such as SL1 to SL7 (which comprised three males and four females) to ensure confidentiality and protect the identities of the participants. Afterwards, the anonymized coded transcript was thematically analyzed, as indicated by Cohen et al. (2011). A thematic analysis was conducted to identify recurring themes which were used to further deal with and provide answer(s) to the research questions raised in the study. We ensured and strictly followed the iterative process (Astalin, 2013) of the analysis for comparison and summarization of collected data collected to arrive at a conclusion strictly aimed at answering the research questions.

Ethical Consideration

All ethics of humanities and social science research were observed in this study, as stated in the *Declaration of Helsinki.* Prior to the collection of data, the sample voluntarily participated in the study. English was used as a medium of communication during the interview process. The confidentiality of participants and their responses was assured.

RESULTS

Seven SLIs, who worked remotely to virtually interpret to deaf students in a Nigerian university during the Covid-19 lockdown, participated in the study, four of which were females, others were males. Just one of the participants had work experience of five years and 2 months, while the highest years of work experience was

about 17 years. Three out of the seven SLIs had a college certificate (the Nigeria Certificate of Education) in deaf education, three had a bachelor's degree in deaf education and the others had a master's degree in deaf education respectively (See Table 1 for further information on the participants).

Table 1. Demography of the study participants

Participants characteristics		Frequency (%)
Gender	Male	3 (42.9%)
	Female	4 (57.1%)
Years of work experience (years)	1 – 10	1 (14.3%)
	11 and above	6 (85.7%)
Educational Qualification	Nigeria Certificate in Education (Special)	3 (42.9%)
	Bachelor's degree	3 (42.9%)
	Master's degree	1 (14.3%)

In response to the main overarching research question in this study, which sought to determine (i) enablers and (ii) constraints of VSLI during the Covid-19 lockdown in Nigeria, the following themes in table 1 emerged.

Table 2. The themes associated with each concern of the study

Variable	Themes
Enablers of VSLI during Covid-19	Government policies
	Empathy
Constraints of VSLI during Covid-19	Epileptic power supply
	Internet connectivity
	Lack of institutional support
	Comprehensibility

Enablers of Vsli During the Covid-19 Lockdown in Nigeria

Government Policies

Government policies emerged as the first theme that enabled VLSI during the lockdown. No one was prepared for the emergence of Covid-19, which led to a high mortality rate in the first three months after Covid-19 had first been detected. To curb or control the community spread of the deadly virus, the government of Nigeria, as done by other nations, enacted various policies, such as the total lockdown of the country to stem the tide of the spread of Covid-19 (Adigun et al., 2022). The policy affected all sectors and essentially led to the closure of basic primary and post-secondary institutions. Participants in this study noted that the policy influenced the need to participate in remote/virtual SL interpretation for deaf students. In support of this assertion, SLI 6 said the following:

> *Since the government declared the lockdown as a measure to combat the spread of Covid-19 and the academic calendar was asked to continue remotely, the sing language interpreters had no choice than to continue our interpreting activities online.*

Also, SLI 2 added that:

> *The participation of deaf students in online classroom activities compelled sign language interpreters in the university to engage in virtual interpreting.*

SLI 7 further corroborated SLI 2. SLI 7 by adding the following:

> *Of course, prior to Covid-19, no one was doing online interpreting until the online classes began during the lockdown. I had no choice but to participate since it is the University's decision.*

As indicated by the SLIs who participated in this study, the lockdown by the emergence of Covid-19 and decision and or regulation of the University system to move academic activities to virtual platforms propelled virtual sign language interpreting for them. In other words, one of the conditions that served as enablers of VSLI in Nigeria was government and organizational policies.

Empathy

"*Empathy"* is a concept generally used to refer to an individual's ability to emotionally understand the feelings of other persons; and perceive issues from the point of view of other people, while putting oneself in their position. This study further showed that the participants in this study were concerned about the plights of deaf students who were members of remote classes. Below are some extracts from the scheduled interview with the participants:

SLI 1 commented as follows:

> *I usually have pity for deaf students because they miss out on so many occasions on issues that relate to academic discourses. In some instances, they get the required information very late. Therefore, when classes were being conducted virtually, my concern was how well the deaf students will be able to cope. But I did my best during the remote interpreting.*

According to SLI 1, her concern for academic wellbeing and wholesome inclusion of deaf students makes her more passionate about her engagement in VSLI during the Covid-19 lockdown. In a similar vein, SLI 5 shared the same sentiment as SLI 1:

> *I strongly believe that the academic performance and or learning outcomes of deaf students in the University are relatively proportional to my service as a sign language interpreter. So, I believe that my job is crucial for the survival of deaf students. Therefore, I will say that my participation in the virtual class was because I feel they will miss out of much cogent information if a sign language interpreter is not available in an 'online' class.*

SLI 4 added that:

> *Although we (SLIs) in the university were not compelled to engage in remote interpretation because of the supposed unavailability of required support, most of us did have engagements with the students (deaf students) because of our passion for their growth and learning outcomes. Specifically, I (SLI 4) strongly want deaf students to excel in their studies.*

SLI 3 further noted that:

> *Even though deaf students have access to transcriptions during their classes on Zoom, I believe that having such online classes interpreted would be the best for them. That is my main reason for joining and interpreting the virtual classes during the lockdown.*

Besides the fact that government and organizational policies fostered remote teaching during the lockdown, SLIs passionately engaged in VSLI to deaf learners. The findings showed that SLIs were not only passionate about the job but were also very much concerned about the educational plights of deaf students who participated in virtual teachings during the lockdown in Nigeria.

With reference to the *constraints that militated against effective and efficient VSLI during the Covid-19 lockdown*, four themes (epileptic power supply, internet connectivity, lack of institutional support, and comprehensibility) were generated.

Epileptic Power Supply

The participants in the study expressed their dissatisfaction with the epileptic nature of electricity in their respective areas. According to them, they submitted that irregular availability of electricity hampered their virtual sign language interpreting activities. In support of the foregoing, SLI 6 said:

> *I must say that the lack of electricity frustrated my effective participation in remote interpreting. There was always a power failure, and I cannot be using a generator (Alternative power supply) to power the house so I can have my laptop charged.*

Also, SLI 4 remarked that:

> *The lack of electricity frustrated my efforts at efficiently interpreting remotely during the lockdown. It was very challenging to engage in a virtual interpreting service when you are not sure if you will be able to complete an interpreting session.*

SLI 2 echoed similar concerns about the issues of epileptic power supply. SLI 2 stated that:

> *The regular supply of electricity is a strange phenomenon in my suburb. Sometimes, when we have about four to six hours of constant supply of electricity, it is like a blessing. So, lack of electricity was a major issue to active participation in remote teaching that involved sign language interpreting during the lockdown.*

As indicated by the participants of this study, even with their passion for an unhindered deaf education, their effort to effectively engage in VSLI was hampered by the irregular power supply. In other words, the lack of constant electricity was a disadvantage to the achievement of efficient VSLI during the Covid-19 lockdown that precipitated the virtual education of all Nigerian students.

Internet Connectivity

It is undeniable to say that the availability of fast and reliable internet connectivity is directly proportional to the perceived level of satisfaction derived from a virtual learning environment. In other words, reliable internet connectivity is paramount for two-way (tutor-students/students-tutor) successes during remote teaching and learning processes. Regrettably, the participants of this study vehemently frowned on the state of internet availability and connectivity in their respective areas. With reference to the foregoing SLI 1 stated that:

> *Internet connectivity was a serious challenge for me even as I tried to actively engage and interpret deaf students remotely. It was very frustrating not only for me as I was interpreting virtually but also for the lecturer and deaf students.*

SLI 1 continued:

> *You can imagine how frustrating that there is a delay in receiving the content of the lecture on my side and no network issue on the side of the deaf students or network difficulties on the side of the student while I have continued signing only for the student to send you a message that you should repeat what you have said. Imagine how frustrating that can be.*

SLI 1 stated that speaking was very uncomfortable with the state of internet connectivity, while engaging in VSLI during the lockdown. In relation to the statement of SLI 1, SLI 5 also said that:

> *It is very challenging and demanding to engage in remote interpreting in Nigeria. Internet connectivity can be frustrating. I can remember during the remote sign language interpreting sessions, I had to recharge each of my two Sim cards. I usually switch from one to another to have access to regular internet services.* (A SIM (Subscriber Identity Module) card is a plastic piece with a circuit-embedded chip that stores identifying information on a mobile device.)

SLI 7 did not only complain about the dwindling availability of internet access and speed of internet connectivity, but also about the cost of internet connectivity. SLI 7 noted that:

> *Despite the fact that the internet was so slow and made remote interpreting very difficult, the cost of recharging data was high. I must say that remote interpreting was a herculean task during the lockdown. As for me and some of my colleagues, it wasn't an enjoyable activity. Internet connectivity messed it up.*

All the participants in this study were not comfortable with the state of internet accessibility and usability for the purpose of conducting remote sign language interpreting activities. They noted that internet accessibility was poor with low bandwidth, slow internet speed, and the high cost of internet made VSLI during the Covid-19 lockdown a major challenge.

Lack of Institutional Support

The participants detailed their regrets about the lack of support of any form from their institution. Some participants indicated that they were not reimbursed for the costs of data bought for the purpose of remote sign language interpreting. SLI 2 said that:

> *Since I joined the university, there has not been any special training for sign language interpreters not to talk of preparing us (sign language interpreters) for digital interpreting.*

SLI 6 buttressed the statement of SLI 2:

> *Sign language interpreters who worked remotely with deaf students did it based on humanity and empathy. The university did not provide us with laptops or the Internet.*

SLI 3 added the following:

> *Each one of us sources the gadgets and the Internet by ourselves. No special allowance was paid for the service.*

The participants in the study were upset about by the lack of support and concern of their institution. They indicated that they did not receive any form of support from their institution for virtual/ remote interpreting before, during and after the Covid-19 lockdown in the country. Hence, they felt that the lack of required support from their institution discouraged them from giving their best for virtual sign language interpretations during remote teaching for deaf students.

Comprehensibility

Sign language interpreters are usually concerned about how well their clients can comprehend what is being communicated to them through sign language. Interestingly, the foregoing was the concern of the participants in this study. For instance, SLI 5 indicated the following:

> *My major concern while interpreting virtually during the cause of various online lectures which took place during the lockdown was how well the deaf participants will understand me at the other end.*

SLI 2 shared the following concern:

> *The ability of deaf students to adequately comprehend interpreted classes was my major headache. The fact that the Internet was disturbing the easy flow of discussion added to my anxiety about how well deaf students were able to follow the lecture series and understand interpreted messages.*

Another participant, SLI 4, said:

> *I always have deaf students come back to me through WhatsApp to re-explain some concepts to them even after the lecture is long finished. This was because they would say, they couldn't see well what I interpreted or there was an Internet glitch among other factors that prevent them from easily grasping of interpreted concepts.*

SLI 7 also submitted that:

> *I am very concerned about the level of fatigue experienced by deaf students who are seated behind the computer for hours. I strongly believe that their attention span is always threatened by long hours of watching interpreted lectures.*

The findings showed that the participants were worried about the level of comprehension and how well deaf students who participated in virtual learning could understand the interpreted lectures. The concern of the participants was intensified by the reoccurrence of technical/internet glitches, the attention span of deaf students and perceived fatigue because of extended hours of focus on virtually interpreted lectures.

DISCUSSION

The philosophy and principles of inclusive education (McDermid, 2020; Thoutenhoofd, 2005) have encouraged the appointment of educational sign language interpreters at various institutions of higher learning (Marschark et al., 2005; Napier, 2004; Powell, 2013). Although, it may be convenient to assert that none of the institutions of higher learning that appointed educational sign language interpreters were

prepared for the engagement of SLIs in virtual interpreting, like during the lockdown occasioned by Covid-19 in Nigeria. However, while the pandemic lasted and lockdown measures were implemented as a measure to curtail the spread of the virus, educational activities continued, especially at various institutions of higher learning in the form of virtual teaching. Interestingly, Nigerian higher educational institutions were not left out of virtual teaching (Adeyanju et al., 2022). Hence, the involvement of SLIs who engaged in VSLI. However, concerns were raised about factors that hampered VSLI, but no research evidence has yet shown factors that motivated or hampered VSLI in Nigeria. Hence, this study presented qualitative evidence of 'enablers' and 'constraints' of virtual sign language interpretations (VSLI) at an open and distance education, as it occurred during the Covid-19 lockdown in Nigeria.

Based on the Jobs Demands Resources Model (Dean & Pollard, 2001), as a theoretical framework, the findings of this study showed that there are two major factors: government policies and empathy that encouraged the participation of SLIs in remote interpreting for the duration of the lockdown. The findings of this study on government policies have been echoed by a plethora of past research. For instance, Adeyanju et al. (2022); Adigun (2022); Adigun et al. (2022); Alqraini and Alasim (2021); Alshawabkeh, Woolsey and Kharbat (2021); Baroni and Lazzari (2020); Williams (2021); Lynn et al. (2020); Mathews et al. (2022); McKibbin (2021); Newbold, 2018, and Safirista et al. (2022) were among existing studies that attested to governmental intervention curbing the tide of Covid-19 and its potential influence of community transmission. To halt or curtail the negative impact of Covid-19 on the human population and other relevant sectors, like many other countries, among others, Canada, Nigeria and South Africa Alqraini and Alasim (2021) stated that the government of Saudi Arabia also placed the country in lockdown. As stated by Adeyanju et al. (2022), the lockdown occasioned by Covid-19 encouraged he use of digital media by Nigerian Universities for teaching and learning purposes. In other words, the proclamation of the lockdown measure in Nigeria and educational stakeholders' measure to salvage the academic calendar cumulated in having virtual classes that were also attended by deaf students.

Although, the argument of Adeyanju et al. (2022) was that Covid-19 further promoted distance education existing studies have shown that government policies have for a long time favored open and distance education in Nigeria and beyond (Bower & Hardy, 2004; Caruth & Caruth, 2013; Mdakane et al., 2022; Pregowska et al., 2021; Sari & Nayir, 2020; Shahabadi & Uplane 2015). One of the expositions of this study was that government policies on the lockdown engaged the entrants of SLIs into remote open and distance education whereby they had to interpret to deaf students who participated in virtual learning. Although there is a dearth of existing studies, especially from Nigeria, that have provided such a report study, Napier, Skinner and Turner (2017); and Skinner, Napier, and Braun (2018) in the United States have earlier exposed the role of SLIs in remote interpreting with positive results leading to active engagements of deaf people. Our study further confirmed that, apart from the fact that government and institutional policies influence the engagement of SLIs in virtual education, SLIs also empathized with deaf students who participated in remote teaching, despite the challenges associated with sign language interpreting (Adigun, 2019; Hall, Hall, & Caselli, 2019; Hale, Valero Garces & Martin, 2008; Jimenez-Arberas & Diez, 2022; Kilpatrick (2016); Napier, Skinner, & Turner, 2017; Witter-Merithew, 1999) our study revealed that SLIs were truly concerned about their clients, deaf people, and their access to required real-time information. In other words, they were truly empathetic about the academic success of deaf students. Unfortunately, studies of Adigun (2019); Harvey (2001); Kilpatrick (2016) and Jimenez-Arberas and Diez (2022) affirm that the empathetic nature of SLIs is a predictor of several episodes of burnout and stress, vicarious trauma; musculoskeletal diseases and mental health challenges recorded among SLIs.

Epileptic power supply and the challenges associated with quality accessibility to fast and reliable services were among the identified factors that served as constraints to quality and efficient VSLI for the deaf during the lockdown in Nigeria. Our study found great dissatisfaction with the state of electricity in Nigeria. Computer gadgets undeniably require electricity supply to function. Unfortunately, participants in our study noted that irregular electricity supply was a barrier to the achievement of efficient VSLI during the Covid-19 lockdown that precipitated virtual education of all Nigerian students. Apart from the electricity challenges, inadequate access to fast and reliable internet services were identified to negatively affect the efficient delivery of VSLI to deaf students. Participants in this study not only vehemently frowned on the state of internet availability and connectivity in their respective areas, but were also infuriated by the cost of internet data bundles.

A finding of the current study supported the results obtained in the studies of Adigun (2019); De Meulder et al. (2021); Koustriava (2022); Kumar et al. (2018); Maphalala and Adigun (2021); McKibbin (2021); Panyukova and Sergeeva (2019); Qin et al. (2014); Schwenke et al. (2014), and Sife et al. (2007). According to Adigun (2019), Kumar et al. (2018), Qin et al. (2014) and Schwenke et al. (2014), sign language interpreters are usually pressured by inadequacies of required facilities that enhance their job performances. Hence, they seem to be overwhelmed when required facilitates are lacking Alqraini & Alasim, 2021; De Meulder et al., 2021, Halley et al., 2022; McKibbin, 2021). Regrettably, earlier studies by Maphalala and Adigun (2021); Panyukova and Sergeeva (2019), and Sife et al. (2007) assert that epileptic supply of electricity and low internet bandwidth remain major challenges to successful implementation and execution of e-learning. With reference to electricity, the findings in this study did not correspond to those of De Meulder et al. (2021), Halley et al. (2022) and McKibbin (2021), whose study participants did not complain about electricity challenges, but were overwhelmed with financial issues such as a lack of suitable workplace and equipment and technical/internet glitches as many of these participants indicated.

It is quite appalling that, despite the nature of the job rendered by SLIs, they receive little to no institutional support. Participants in this study detailed their regrets about the lack of support in any form from their institution. They were not supported with regular training opportunities or a supply of fast, reliable internet data bundles for the purpose of VSLI during the lockdown. Thus, the participants believed the lack of required support from their institution discouraged them from giving their best for VSLI during remote teachings for deaf students.

It is quite appalling that, despite the nature of the job rendered by SLIs, they receive little to no institutional support. The participants in this study detailed their regrets about the lack of support in any form from their institution. They were not supported with regular training opportunities or supply of fast, reliable internet for the purpose of VSLI during the lockdown. Thus, the participants believed that the lack of required support from their institution discouraged from them giving their best for VSLI during remote teachings for deaf students. The findings of this study are like what was reported in the study of Adigun (2019) and De Meulder et al. (2021) Maphalala and Adigun (2021); Panyukova and Sergeeva (2019) and Powell (2013) who noted that various academic institutions failed to train and re-train their support staff members. Specifically, Maphalala and Adigun (2021); Qin et al. (2014) as well as Schwenke et al. (2014) aver that the lack of institutional support pose a danger to retaining professionals in the educational sectors. While Alqraini and Alasim (2021) appreciated the role of SLIs in providing interpreted teaching/lecture series to the deaf during the Covid-19 lockdown, Alqraini and Alasim (2021) frowned on the low level of technical support, training and re-training SLIs received. Powell (2013) raised concerns about the lack of adequate institutional support for SLIs and their potential abilities to perform adequately in a postsecondary teaching environment. With reference to the assumption of the Jobs Demands Resources Model (Dean & Pollard, 2001) and the findings of Powell (2013) in his study among SLIs in New Zealand, Nigerian SLIs were also concerned about the status and structure of sign language interpreting as a profession and career development (Adigun et al., 2021 & Eni-Olorunda, 2005).

The job of SLIs is not completed without adequate comprehension of interpreted messages by deaf people. Hence, the challenges faced by SLIs who participated in our study intensified their concern about the comprehensibility of a virtually interpreted lecture series during the lockdown. Our findings revealed that the comprehensibility of deaf students, as a concern, was intensified by the reoccurrence of technical/internet glitches, the attention span of deaf students and perceived fatigue because of extended hours of focus on virtually interpreted lectures. Past studies stated that SLIs who interpret remotely are usually overwhelmed (Alqraini & Alasim, 2021; De Meulder et al., 2021, Halley et al., 2022; McKibbin, 2021; Napier et al., 2017; Skinner et al., 2018). Alsadoon and Turkestani (2020) as well as Alqraini and Alasim (2021) allude that SLIs who are working remotely are always worried about the state of understanding deaf learners who are unmonitored at the far end of video-conferencing gadgets. Alqraini and Alasim (2021) noted that the source of SLIs' worry stem from the perceived language abilities of deaf students and their attention span during remote/virtual teaching and learning sessions. More so, Williams (2021) and Lynn et al. (2020) identified the possibility of Zoom' gloom and fatigue during remote interpreting sessions as factors that may threaten the comprehensibility and active participation of deaf students in remote teaching and learning activities.

CONCLUSION

The current state of education globally is attached to technology. Excitingly, the emergence of Covid-19 encouraged the adoption and use of technology, especially video-conferencing technologies for teaching and learning activities. While there is an established increase in the population of deaf students at institutions of higher learning, our study hinged on the Jobs Demands Resources Model focused the attention on the plights of SLIs through our assessment of (i) enablers and (ii) constraints of VSLI during the Covid-19 lockdown in Nigeria. This qualitative evidence concluded that government policies and the empathetic nature of SLIs were enablers of VSLI during the lockdown in Nigeria, while four themes, epileptic power supply, internet connectivity lack of institutional support, and comprehensibility of deaf students who attended remote lectures were found to serve as barriers to effective and efficient VSLI as obtained among the participants of this study.

Recommendations

While the authors of this study acknowledged the importance of government policies on education for all and educational and social inclusiveness, it is important for the government to pay attention to the sign language interpreting profession, specifically the government of Nigeria should develop policies that will promote education, training and re-training of SLIs. Postsecondary institutions should always listen and provide an immediate positive response to the needs and requirements of SLIs because they are not just a conduit for information dissemination, but also serve in the position of a 'teacher/tutor/lecturer' with the services they render to deaf students to make equitable and inclusive education accessible to the deaf population. Therefore, educational institutions should provide improved services and remuneration for the education of SLIs. There is a need for the establishment of an interpreters training program that will specifically provide recurrent training and certification for SLIs. More so, the wellbeing of educational SLIs should be prioritized at all levels of education and more focus needs to be placed on those SLIs at tertiary institutions. We advocate for extensive support for the education of SLIs. They should be adequately trained in remote interpretation, especially in the fourth industrial revolution. Lastly, through government and institutional policies, all requirements for efficiencies in virtual sign language interpretation should be made available by various institutions of higher learning that serve deaf students.

Limitations of the Study

No study is exhaustive. In other words, there are various limitations to every research endeavor. Hence, we acknowledge that our study has its limitations. For instance, we adopted a qualitative research design to interview seven SLIs who remotely interpreted lectures to deaf students during Covid-19 lockdown in Nigeria. Meanwhile, this study did not juxtapose the findings from SLIs with that of the administration of the two institutions selected for the study and also not the findings of deaf students who participated in remote teaching and learning activities during the period under consideration. Therefore, we are limited in the generalizability of the findings. Based on the foregoing, we suggest a replication of this study but the study should bridge the gap identified in this study.

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THE INVESTIGATION OF ORGANIZATIONAL CULTURE ELEMENTS AND TYPOLOGIES IN A GIGA OPEN UNIVERSITY: ANADOLU UNIVERSITY OPEN EDUCATION FACULTY 40TH YEAR RESEARCH

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ABSTRACT

Organizational culture acts as the mortar that connects the bricks. Every institution has its own unique culture which has been adopted and shared by all employees over the years. As establishment stories, ways of doing business, and communication styles change, culture also adopts itself to these in a way that is specific to that organization. Since there is no single understanding of culture covering all types of institutions, research has focused on classifying the concept of organizational culture according to types and concentrated on situational studies. As in for-profit businesses, culture is also significant in organizations that prioritize social goals. In this research, an academic organization within the realm of public institutions is discussed. The purpose of the article is to reveal the functioning of the elements that make up the organizational culture of the Open Education Faculty in the institution and the types of culture that are seen as dominant in the organization. In the case study, semi-structured interviews were conducted with the managers who have taken important roles in the history of the institution, and the documents containing information about the faculty culture were analyzed. The results of the qualitative content analysis revealed that Anadolu University Open Education Faculty has a strong and established culture, and this contributes to the work done and institutional development. Considering the dominant cultural styles in the institution; it is noteworthy that it started as an effective, collaborative, dynamic and work-based culture. With the institutional growth being experienced over time, the faculty culture has evolved towards a more protective, bureaucratic, and analytical one due to the difficulties in the organizational environment and the risks in the decisions taken. However, considering the scope, structural features, and stakeholder diversity of open education at home and abroad, the faculty still maintains a dynamic, collaborative and developmental cultural style with its ability to coordinate between units, its flexibility to respond to environmental changes, and its efforts to take innovative steps.

Keywords: Organizational culture, academic organization, elements of culture, types of culture, content analysis, management of open higher education.

INTRODUCTION

Culture is the creation of meaning through which human beings interpret their experiences and guide their actions (Geertz, 1973, p.24). Thus, culture is dependent on the meanings it has for those involved in that culture. Meaning refers to how something is interpreted subjectively by an individual. Individual meanings are certainly important and they are likely to vary across a group. Nevertheless, cultural understanding

does not focus on these individual interpretations, but on collectively shared orientations within a group (Alvesson, 2002). Cultural analysis can be applied to all kinds of social phenomena as long as it concentrates on meanings tied to each other and reflected in a symbolic form. Organizations are also infused with symbols, which create a distinct identity. Organizational culture, then, may be conceived as a pattern of symbols that needs deciphering and interpreting.

In today's world where competition has exceeded countries, it is important to formulate and correctly apply the elements that strengthen the institutions such as organizational culture, which is crucial for those aiming to understand people, strengthen corporate performance and belonging. Understanding culture is known to have positive effects on the performance and effectiveness of organizations in the long run (Ubius and Alas, 2009, p. 90). It is an accepted fact that organizational culture is primarily related to organizational success and failure (Cameron and Sarah, 1991; Lim, 1995). Ouchi and Wilkins (1985) argue that research on cultural and symbolic elements in organizational life has come to the fore as the Japanese surpassed American firms and were accepted as the new economic power in the late 1970s. Alvesson (2002) states that organizational culture is a subject of interest at the level of management research and academic studies, since it has a central role in all areas of organizational life. Organizational culture, which is terminologically included in Pettigrew's article in 1979 for the first time in the academic literature, has become a concept whose importance is increasingly recognized over time (Hofstede, 2001). In this context, culture has been the subject of many studies regarding its definition, boundaries, elements, types, analysis methods and related concepts (Schein, 2010; Schneider, Ehrhart & Macey, 2013; Wilkins & Ouchi, 1983). Organizational culture, which is significant for every institution from the strongest to the weakest in the sectors, is not an individual but a socio-cultural reality (Durgun, 2006). There is a need to understand the organizational culture in order to analyze the characteristic aspects that distinguish institutions from each other, to strengthen the influence of human and other resources, to combine parts and achieve institutional goals.

Organizational Culture

Organizations that bring together people with different characteristics and structures to achieve a certain purpose can provide joint effort and cooperation with the support of the organizational culture. There are various definitions in the literature on organizational culture, all of which emphasize its unifying strength. Hoy and Miskel (2010) describe the concept as a system of orientations that keeps departments together and gives the institution a unique identity. According to Armstrong (1990, p. 206), organizational culture is a model of beliefs, attitudes, and expectations that guide employees in their ways of doing business and behaviors, and emerge through interaction. Dincer (1992, p. 271) defines the concept as a system of norms, values, beliefs and habits that affect the activity results of institutions and direct the behavior of people in the organization. Sabuncuoglu and Tuz (2001, p. 37) define organizational culture as a whole body of unwritten symbols, stories and past events that emerge over time that teach employees how to behave, find solutions for organizational problems and are based on general acceptance.

As a result of the definitions and conceptualizations made in the organizational studies literature, some features of organizational culture emerge. Eren (2010, p.138) gathered these features under four headings listed as follows:

- Organizational culture is an acquired and learned phenomenon.
- It is accepted by the employees and shared with others.
- It is not written, it is the thoughts, beliefs and values of the members of the organization.
- Behavioral patterns may occur because they are constantly repeated.

The concept of culture, which comprises the identity and style of organizations, is formed and shaped in a process. In the first stage, the ideas of the founder of the organization emerge. Second, the team is formed and these ideas are improved. In the third stage, the team tries to provide appropriate resources such as buildings, places, funds for the organization. In the last stage; different people are included in the organization and the general organizational culture begins to be built (Dogan, 1997, p. 63).

There are some functions that organizational culture provides for institutions. It is possible to list these functions as follows (Ozkalp & Kirel, 1998, p.109):

- It distinguishes organizations from others.
- It gives the members of the organization a sense of identity.
- It enables individuals to attach to the common value more than their interests.
- It increases the solidarity among the members of the organization.
- It becomes a control mechanism over the attitudes and behaviors of individuals.
- It facilitates the adaptation of employees to the organization.

Just as the culture of societies is important for the survival of citizens, organizational culture also has an impact on organizational functioning (Denison and Mishra, 1995). Organizational culture, which accepts the organization as a living organism beyond seeing it as a machine, adds a new dimension to organizational studies (Kara, 2006, p. 43). It also brings holistic thinking skills at the level of values and behaviors to research (Ashkanasy et al., 2000, p. 5).

Schein (1985, p. 209) defines the sources that determine organizational culture as founders, external environment and internal environment. Robbins (1990, p. 444) argues that the hypotheses and judgments of the founders will affect the life of the organization and that the people whom the founder recruits at the beginning will continue this process by interacting with the culture. The external environment is a resource that organizations cannot control. The natural environment, historical events, economic conditions, political developments, laws, technology, socio-cultural forces are the external environment elements that affect organizational culture (Berberoglu, 1990, p. 157). Tosi (1986, p.66) expresses the internal environment elements that determine the organizational culture as the subject of production, the technology used in the institution, employees and managers.

In order to analyze organizational culture, the elements that make up the concept must be well understood. Schein (2010, p. 219) links the formation of culture in institutions to the values and assumptions that the founding names believe, the experiences of the employees, and the new beliefs, values and assumptions brought by the newly recruited members and leaders. Demir (2007, p. 29) includes rites, ceremonies, language, tales, customs, habits, beliefs, legends, stories, and assumptions into the elements of organizational culture. In Ozcan (2011) the elements of organizational culture are norms, values, assumptions, symbols, language, ceremonies, rituals, stories, leaders and heroes.

Values represent the desired ideals (Sabuncuoglu and Tuz, 1998). It is necessary to create key values that will provide motivation when shared, create a powerful resource around which all employees will gather (Erdem, 1996, p. 38). Language used in organizations, in addition to providing internal communication, is also essential in terms of ensuring the continuity of culture by providing transfer to future generations (Pala, 2009, p.18). Symbols, defined as objects, or actions that serve to convey and share ideas, values and feelings (Terzi, 2000, p. 55), are also a crucial element of culture. Logos, slogans, songs, titles, clothing, architecture of buildings, office arrangements, etc., which may be taken as signs of culture, are among the examples that make the reproduction of organizational culture possible (Bakan, 2004, p. 59). Ceremonies are generally considered as activities that aim to celebrate, reinforce cultural values and increase loyalty among employees (Bakan et al., 2004, p.60). They also aim to maintain the organizational order, give a message to the internal and external environment, and strengthen the sense of commitment (Fairholm, 1994, p.84). Rituals, which is another cultural element, is a set of rules that regulate people's daily attitudes, behavior and lifestyles. Meeting formats, correspondence format, applications in daily workflow, etc. are practices that give culture a tangible quality (Arslan, 2014, p. 36-37). Stories that contribute to the formation of organizational culture are stories based on real events in the history of the organization and shared by the members of the organization and transferred to new employees (Daft, 1992, p.319). Finally, leaders are expressed as pioneers, models and representatives who reflect the basic values and beliefs that form the infrastructure of organizational culture in their own personalities (Farnham, 1997, p.17).

There are various studies aimed at understanding, measuring and creating typologies of organizational culture. Bill Schneider, Miles and Snow and Toyohiro Kono's organizational culture classifications are the studies included in the analyzes within the scope of this study.

Schneider (1988) classified the culture formed in organizations under four headings as control, cooperation, talent and development culture. The purpose of the control culture is to ensure, protect and improve the

success of the organization. In the decision-making processes, a central and analytical way is followed in communication and information flow, where authority and rules are dominant (Schneider, 2000, p. 27). Collaboration culture related to synergy is based on closeness and even dedication to the target audience. Decision-making processes are more informal and human-oriented in this culture where target audience goals are a priority. Collaboration culture, which has a deep commitment to its employees, is focused on gaining the trust of the employees. Success in talent culture is to establish an organization composed of people with the highest competence and to benefit from these employees. Intellectual and technical skills are encouraged in institutions with this culture (Schneider, 1995, p.12-16). What is important in the development culture is the belief of employees in high values and continuous improvement. This culture requires trusting the employees and the organization. When individuals believe that their work is valuable, they can achieve organizational goals as their own. Excessive control and prohibition do not work. It is accepted that mistakes can be made from time to time and this should be considered normal (Schneider, 1995).

In another organizational culture classification by Miles, Snow, Meyer and Coleman Jr., (1978), organizations are grouped under four titles as protective, developer, analyzer and responsive, based on the traditions, habits and strategy formations they have. In a protective culture organization do not like risk and they operate in safe markets. It is a conservative structure. Stability is maintained by values and beliefs. However, there is a risk of being ineffective in responding to major changes in the environment and missing opportunities (Miles et. al., 1978, p.550-551). In the developing culture adopted by innovative organizations, institutions are courageous to take risks and make new breakthroughs. Managers can apply development and growth strategies in changing environments by not avoiding competition (Akinci, 1998). Analyst culture, which is a combination of developing and protective culture types, tries to keep the profit high and minimize the risk. The application of different approaches together in the protective organizational culture, where change and balance coexist, can sometimes create difficulties (Miles, et. al., 1978, p.553-557). In the reactive/responsive culture, the pressure of change from the environment and competitors is important for organizations. However, managers cannot respond effectively (Eren, 2012). Strategies are as significant as the adjustments made in order not to go bankrupt and survive (Yildiz, 2008, p.20).

The last of the organizational culture classifications considered is the culture typology of Kono (1992). According to Kono grouping; cultures are classified into categories as dynamic culture, leader-oriented and dynamic culture, bureaucratic culture, stable culture and strong leader-oriented stable culture. In a dynamic culture, the hierarchy and the social distance between the subordinates is low; interactive, innovative, horizontal and vertical communication are seen together, and there is a customer- and employee-oriented family feeling (Okay 1999, p.229). In a leader-oriented dynamic culture, a strong leader who is the founder of the organization is a role model. Employees trust and follow the leader. As long as it is active in management, this type of culture is highly functional. However, when the administration gets old or starts to make wrong decisions, it becomes stagnant in the culture (Kono, 1992). The type of culture in which rules and procedures are dominant and employee behaviors are limited within this structure is bureaucratic culture. It is generally seen in old and massively operating institutions (Bakan, 2004, p.103). When it comes to static culture, it is expressed as a type of culture that is closed to innovation and does not react to changes in the environment, and one where old behavior patterns are repeated. It is more common in public institutions or institutions operating in monopoly markets (Kono, 1992). Kono's final culture typology is stable culture with a strong leader axis. In this culture, autocratic top management expects employees to obey rather than asking for opinions. Even if the leader makes wrong decisions, they must be implemented. In this type of culture, institutions cannot develop because they have remained in the same position for many years (Akinci, 1998).

Problem Statement

Organization culture is a phenomenon that can be shaped differently depending on the public, private sector, production or service sector distinctions. The academic institutions covered in the research aim to provide higher education service to the public either they are public or privately funded; thus, their contexts deserve a unique attention. The organizational culture perspective into understanding the relationships or patterns in higher education contexts has been quite popular in the fields of both management and education. One of the most influential of these works is by Bergquist (1992), who identified four distinct

cultures in American higher education, recognizing that each culture can only be understood in the context of its historical roots and its multiple representations in the campus. These cultures are: collegial culture, managerial culture, developmental culture, and negotiating culture. Cultural elements in all these types may differ in many respects, from objectives within the organization to human resources, from ways of doing business to communication styles. However, the organization in question is neither a traditional campus university nor a conventional faculty with a departmentalised structure in which faculty are grouped together under disciplines. That is why there is a need to investigate its uniqueness and from a qualitative perspective.

Berberoglu et al. (1998: 40) define academic institutions as non-integrated and fragmented organizations. Instructors tend to perceive themselves as a part of the profession rather than as a member of the organization they work for; and individual career goals may be a priority in their scientific studies, rather than organizational goals. Evidence is essential to understand whether the non-integration and fragmantation of goals is also apparent in this culture. There is a need to investigate how culture manifests itself in this particular organization as it is not a mainstream public academic institution but has a unique organizational design which is far different from that of a conventional faculty of a university.

The features that support organizational culture in academic institutions are scientific working environment, level of competition, informal communication channels, teamwork, cooperation, coordination, flexibility and communication with the target audience. In a study using interview data by Kuo (2008) with the purpose of investigating how faculty in a US university perceive and construct their relationships from an organizational culture perspective, findings suggested that in general the relationships between academic staff and administrators are professional and based on collegiality, interpersonal dynamics, professionalism and open dialogue; and underscore the importance of appreciating how cultural subjectivity, diversity and complexity can have a direct impact on the evolution of relationships between academic staff and administrators. Evidence might help designing open higher education institutions especially mega ones in a more effective way and build more collegial, open and professional relationships both between the administrators and the faculty and among the faculty.

In this research, a huge academic organization within the realm of public institutions is discussed in terms of its organizational culture. The context of the study; Anadolu University Open Education Faculty is the first practitioner of distance education in Turkiye, operating with a history of more than 40 years and a well-established system. Thus, the main purpose of the article is to reveal the functioning of the elements that make up the organizational culture of the Open Education Faculty as a public academic institution and the types of culture that are seen as dominant in the organization. To this aim, the following research questions are sought:

1) How do the elements that make up the organizational culture in a public mega open education institution function?
2) How do the culture typologies manifest themselves in a public mega open education institution?

METHOD

Research Design

This study which aims to analyze organizational culture in a unique academic institution has been designed as a qualitative case study. Case study is preferred in examining phenomena when direct observation of the concept being studied and interviews with the persons involved in the phenomena are possible (Yin, 2009). Smircich (1983) emphasizes the need to use non-standard measurement tools in studying organizational culture, since each organization has a unique culture, and underlines the preference for qualitative methods instead of quantitative methods. Combined with this perspective of Smircich on how to investigate a unique culture, the strength of case study in its potential to deal with a variety of evidence such as interviews and documents together caused the researchers to design the study as a qualitative case study, the scope of which is Anadolu University Open Education Faculty. The uniqueness of the organization under scrutiny in its ecosystem makes way for a single-case design in order to determine the precise nature of the organizational culture.

Data Collection

While examining organizational culture, one or more of the methods such as observation, interview, questionnaire, focus group interviews, document analysis can be used together (Bahar, 2020). Data collection methods used in this study are face to face semi-structured interviews and review of institutional documents. Interviews were conducted with faculty who held important administrative positions throughout the history of the institution; as it is significant in case studies to collect interview data that focuses directly on the case study topic. Insightful and perceived causal inferences and explanations made (Yin, 2009) by those who have been directly observing and experiencing the culture is a strong source of evidence in this case study. The document analysis is carried out on the printed material named 'The Birth of Open Education', which is narrated by Prof. Dr. Yilmaz Buyukersen, the founding figure. The semi-structured interview protocol was prepared by the researchers, and reviewed by both an expert and a peer researcher for feedback. Upon this review, the questions in the protocol were grouped under themes from the literature. These themes are organizational structure, collaboration, support and trust, the relationship between school and its environment, integration and sense of belonging, professional orientation, and the quality of the learning/teaching environment. The interviews were recorded and transcribed for the purposes of data analysis. Because the researchers are actively involved in the data generation, the questions used in the interview become part of the text as they set some of the functional context for the answers. Therefore, the interviews were transcribed verbatim rather than just the responses of the interviewee.

Data Analysis

All documents and the transcripts of all interviews were analyzed through content analysis, the steps of which are, initial reading, scaffolding, doing the interpretation, and identifying patterns within or across groups or within or across features. Bahar (2020) states that it would be more accurate to develop formulations specific to each organization instead of standard applications in measurement forms related to organizational culture. Therefore, the collected data were subjected to content analysis on the elements and culture types that make up the organizational culture. Content analysis is an analysis method that provides understanding and interpretation of the relationships between categories and codes determined by directly dealing with texts or transcripts (White & Marsh, 2006, p. 30-31).

Research Quality

Several measures were taken to ensure quality criteria mentioned in Yin (2009). Construct validity was ensured by using multiple sources of evidence and have key informants review the draft case study report before final composition. Internal validity was ensured by triangulation and consensus formula. Triangulation is the examination and evaluation of the data obtained within the scope of the findings by more than one person (Guion, 2002, p.2). Within the scope of this study, coding was also done by a field expert other than the two researchers. According to the consensus formula of Miles and Huberman, the average reliability was calculated as 91% in the evaluation of organizational culture elements and culture types. According to Miles and Huberman (1994, p.278-280), a ratio above 70% is sufficient to qualify the research as reliable. A very important way to enhance validity, which was also used in this study to enable the readers to have a more realistic and richer feel of the experiences of faculty members, is using rich and thick descriptions while discussing the findings. Another technique to further the internal validity of the study was peer reviewing of both the interview protocol prepared by the researchers, and the data analysis process as a whole, as well as consulting expert judgement. Peer reviewing is critical because it requires other people than the researcher to ask questions about the study so that the accuracy of the account is enhanced (Creswell, 2009).

Limitations of the Study

Since the research is a situational study, it has limitations in generalization. For this reason, analyzes and evaluations are made on the basis of the institution as the application area.

FINDINGS

The categories and codes determined within the scope of the research were grouped under two themes extracted from the literature. These categories are called the elements that make up the organizational culture and the types of organizational culture. While the elements include leader, stories, language, rituals, values, ceremonies and symbols, in the culture types, Schneider, Miles and Snow and Kono's classifications were determined as themes, which were depicted in Figure 1.

Figure 1. Wordcloud of themes and categories that emerged from findings.

How Do Elements of Culture Manifest Themselves in This Organization?

The first category of codes emerged from the data in this study which aims to analyze the organizational culture of the Open Education Faculty is the leaders. It was seen that there were processes in which a lot of effort took place throughout the history of the institution. As the leader, the founder of the faculty, Prof. Dr. Yilmaz Buyukersen, who was mostly addressed as 'Yilmaz Hoca' by the participants stands out.

A participant coded as K2 mentioned Yilmaz Hoca as the leader as in: "*When Anadolu University was founded, open education faculty was also established. Yilmaz Hoca was prepared mentally… he had a closed-circuit television system installed in 1974 or 75*". This indicates that the founder had prepared the technical infrastructure before the system was put into practice. In the same way, in the publication titled 'The Birth of Open Education', Yilmaz Hoca wrote: "*a camera, tape recorder and a television receiver became our first devices. … We wanted to turn the biggest hall on the top floor of the two-storey building, which was built as an academy during the time of Orhan Oguz, into a studio. But we had neither money nor much knowledge. … we built ourselves a nice little closed-circuit training system.*" This statement strengthens the response of the participant coded K2.

Another participant's remarks support the leader's significance in the initiation and foundation, but also clarifies the starting point of the idea of open education in Turkiye. "*The idea of open education was shaped and born under the leadership of the university rector, Yilmaz Hoca. We had a role model during the establishment process, a British open university. The British Open University, which was established for those who could not continue their education due to World War II, has been an important role model for us.*" (K4) Yilmaz Hoca approves this in his book by "*The idea of open education came to my mind in 1966 when I was in England. …. During the Second World War, discussions began to give British Citizens the opportunity to study, who could not find higher education. This was the initial idea at the British Open University. In the same years, a mass of students who could not enter universities in Turkiye asked the state to solve this problem. I was thinking this could be applied in a slightly different way for Turkiye.*" (Document 1). Another participant (K6) underpins the influence of Yilmaz Hoca as a founding leader and a great inspiration on the organization through "*Prof. Dr. Yilmaz Buyukersen has a great influence on the establishment of this system and the development of its culture. Hoca has*

a charismatic leadership. I can say that the units he founded made a great contribution to the Open Education System, even though their names have changed today." This means that the same understanding of teamwork created in the workflows is still reflected in the present. As well as establishing a team based organizational structure, his efforts in creating resources, technical progress, following the bureaucratic processes, and explaining the idea of open education to the public are also noteworthy among the contributions of Hoca to the establishment process.

> *"I could only do this job with my young friends. I gathered my young friends. We immediately formed a book writing team, a science team, a program team, and an examination team. In the recruitment process, we employed assistants on the one hand and technical people such as cameramen on the other. In the meantime, I was applying to State Planning Organization to get their support and to Higher Education Board to ensure the legal foundation of the project and at the same time writing articles in daily newspapers for public support and recognition" (Document 1).*

The leader figure also has a crucial place in the stories told throughout the history of the organization. "*The story we heard from Yilmaz Hoca tells that Germans sold color TV to Turkiye and the first color TV studios were established in Eskisehir. That the system started with 29500 students while 10000 people had been considered as an unrealistic dream is a second story. In a higher education system as Turkiye's where professors write and sell books for their classes, there have been many stories and firsts in the design process such as the use of television in education. Forget Turkiye, conducting supervised exams in Europe or in many parts of the world and ensuring its supervision are different stories. Behind all this lies a strong will and leadership. This is already in the culture of this university.*" (K3) With these statements, he emphasized the exciting firsts in the history of the institution and the success stories behind mass organizations. Another participant recalls "*What we call a legend is that we delivered many educational programs and saved a stock of learning materials in those six years….There was no such thing as overtime. While we were getting things done, we always had Yilmaz Hoca on our heads. He was constantly under control. Of course, there was a lot of spiritual motivation…. The pioneers and the most famous names of the disciplines were invited to work in our system as content developers and shoot TV programs in the studio. The most prominent persons of the disciplines were invited to deliver lectures. This has caused a multicultural and interdisciplinary perspective to grow within the culture.*" (K2).

Regarding the remarkable events that took place in the history of open education, one of the participants recited the significance of organizing face to face examinations all around the country. "*There were great financial difficulties at that time. In order to overcome these, foundations and companies were established… It is an extraordinary event that in 1994 exam responsibility was transferred to us from the state and exam organizations were made across the country… As employees who visit other universities had the opportunity to compare this place with them, their ownership to the institution has increased, which has fed our institutional culture.*" (K4).

Another important dimension of organizational culture is language. One of the interviewed participants' words reveal how language is taken both as an institutional and also as an academic issue as the foundation of the organization also marks the foundation of the distance education discipline in the Turkish academy. "*The language issue has emerged over time. As the discipline deepened, our terms emerged and now we have a terminology of ours together with our own theories and approaches. We have set up the open and distance learning dictionary to preserve the language. It is accessed online from anywhere in the world. There are over 2200 words. We are increasing this every day.*" (K1). Other participants also perceived language in association with disciplinary language of distance education. "*Language has emerged naturally. We initially modeled the British open university. It took a while. Of course, a lot of translation was done during these studies.*" (K2). Another participant's statements support the idea that language of the organization is generalized as the language of the academic discipline as he/she emphasized the academic journal that the organization publishes (TOJDE) and the dictionary of distance education terminology as critical factors in the establishment of an organizational language. "*All research being conducted and every research paper written and published is significant in sustaining this language*" (K2). "*Language is an interdisciplinary dimension for us. Support is received from areas such as administrative sciences, education and communication. It also has an international dimension. What is England doing? What kind of developments are happening in the world in the name of open and distance learning. The language of open education is formed as a result of their follow-up and the interaction of all stakeholders.*" (K4). The factors

affecting the formation of organizational language stand out as communication with the environment and stakeholders as well as other disciplines of thought. *"As part of this communication, joint studies are being conducted with other universities as well as international audit companies in order to exchange information. International open and distance learning conferences are regulary being held by our organization*" (K4), which as a whole contribute to the development and conservation of the organizational language.

Another important element of organizational culture is rituals. *"What is routine is recording or shooting radio and TV programmes, writing coursebooks and producing testing materials in our testing unit. In the testing unit there is a never-ending activity of producing exam questions. For a long time in the history people worked to accumulate all these materials day and night, without taking any weekend breaks*." (K2). "*There are so many different units in the system with varying roles and responsibilities but all serve the same purpose of operating the system. For example organizational communication unit takes care of social media entries and graphic design of institutional announcements"* (K6). Another participant emphasized the interdisciplinary and multitask-oriented nature of the rituals in the system as "*Open Education System is a modern platform combining people from many disciplines. We have coursebook designers. We have people designing the digital version of these books. One book is created through the team work of eidotrs, chapter writers, language editors, printing press, distribution, and the creation of e-learning materials.*" (K4) The participants mainly referred to routine activities that strengthen culture among employees such as sharing the high workload of conducting research and preparing open education materials at the same time. For example, one of the participants remarked *"Everyone working at this university has two jobs. In addition to their routine work such as conducting research, continuing education activities and publishing, the professors also carry out open education related jobs. In other words, faculty members write in the book, explain in the lecture, go to the exam, write the question for distance education students. If necessary, he also establishes contact with students working in the offices."* (K3). Exam administration meetings, exam question writing meetings, book meetings, and other material preparation meetings held in short- or long-term teams are considered as organizational rituals that influence the culture of an organization.

Another dimension of organizational culture that is considered within the scope of the research is organizational values. In this context, the most frequently mentioned value is knowledge. This value is also reflected in the organization's perceived mission by the participants as to deliver the right information to everyone and contributing to society and higher education through distance and lifelong learning. "*The fundamental value we have is to disseminate right knowledge to everyone*" (K1). "*Our central value originates from the value we add to higher education through distance education and lifelong learning*" (K4). Quality, innovation, reliability and being people-oriented are other prominent values of the institution expressed. "*Paying great attention to the work done has become a tradition and a fundamental value here. Great care is taken in preparing questions, writing books, exams and programs.*" (K2). "*Universality, being research and development oriented, and lifelong learning dedication are our organizational values*" (K3). Another participant listed the values as "*being person-oriented, innovativeness and reliability*" (K6).

Ceremonies are another of the elements and research themes that support organizational culture. The common answer given by all participants on this topic was graduation ceremonies. In the title of ceremonies, "*Meeting and dinner events held in Eskisehir for Open Education provincial coordinators and offices, as well as events held within the scope of graduation ceremonies*." (K5). Ceremonies held to honor successful students in Open Education Faculty Offices as well as graduation ceremonies are also mentioned as being significant, as they bring together students and faculty members who are normally distanced from each other. "*Award ceremonies held in provincial offices bring together students, their families and faculty members*." (K1) "*Students and families come together for concerts and other fun activities after these award or graduation ceremonies. Professors hand out diplomas face to face*" (K2). Another participant mentioned ceremonies that are held for the staff such as department dinners or meetings to celebrate the holidays. "*These are opportunities that academic staff come together with the administrative staff. When staff from all over the country come together for a celebration or an activity, it is like a miracle. They are geographically distanced but they are part of the same organizational culture.*" (K2) Continuous open and distance learning conferences are also events mentioned that contribute a lot to the institution and its culture.

Within the scope of symbols, which is another cultural dimension in the research, the logo of open education is to be primarily discussed. When the interviewees were asked to share their perceptions of the two logos used throughout the history of the institution, all of the participants stated that they liked the first logo more, only one found both effective. About the logo and how it feels, "*this logo symbolizes from the local to the universal. It has a structure that comes out of Anatolia to the world. Its colors emphasize its solidity and strength structure. Therefore, when you look at the institution, we can say that it is a strong institution with both its external architectural structure and this corporate logo structure, and that it has a structure that assimilates the traditional and aims for the future.*" (K3), The solidity and structure are also apparent in the architecture of the Open Education Faculty building, which has the shape of a butterfly, which was mentioned as visually symbolizing technology and innovation by one of the participants. "*When I look at the logo, it tells us our life here, both bitter and sweet. Not only to me, but to whomever you show it, it says my dear. If you show it to the gardener who works in the garden over there, he'll say it's my life.*" (K5). Visual materials such as books, television lecture programs, posters, videos, photographs can be expressed as symbols that create culture and feed institutional memory. The organization's efforts in creating an archive of these visuals as well as sharing them with the public openly through a database called 'Open Science' were mentioned to emphasize the importance of both protecting and displaying these symbols.

The initial logo of the faculty	Revised Logo used both by the faculty and the university in general
ANADOLU ÜNİVERSİTESİ AÇIKÖĞRETİM FAKÜLTESİ	ANADOLU ÜNİVERSİTESİ

Figure 2. The evolution of the Logo

When the people, slogans and concepts that symbolize the institutional culture of the Open Education Faculty were asked to the interviewees, among the answers received were "*working hard*" (K1); "*technology, innovation, cooperation, sharing, openness"* (K3); and "*lifelong education pioneer*" (K4). "*A pioneer because it is the first to be established, flexible due to its capacity to adapt to conditions, and a leader due to its ability to guide… When Anadolu University is mentioned outside the university, first, open education comes to mind. It means that a great organizational culture has been formed. The perception it creates is huge.*" (K5). As far as names given are concerned, Yilmaz Buyukersen, Akar Ocal, Engin Atac, Fevzi Surmeli's names as leaders came out.

How Do Culture Typologies Manifest Themselves in This Organization?

As to the second research question, coding was done according to Schneider, Miles & Snow and Toyohiro Kono's culture types. Among the organizational culture typologies of Schneider, cooperation and control types were found dominant in Anadolu University Open Education Faculty. Open Education Faculty, which was established to benefit the learners who want to receive education unlimited by place, time or age, has received support from the cooperation and synergy provided by the employees since the beginning. The lack of resources in the early periods was compensated by additional efforts and overtime. A cultural structure in which informal communication channels are more common rather than formal relations draw attention. Regarding this issue, K3 said, "*Two-thirds of our lives were spent working here. The most important thing here is cooperation.*" "*This system was born by working in cooperation 7-24 by adding the night to the day.*" (K4). Similarly, another participant recited *"When you count the people who have worked here, you will see that all*

of them add day and night to this system. There are many people. Their common point is that they work hard to improve themselves and reflect this to their work. We take them as an example." (K1).

Over time, although a cooperative culture exists in Anadolu University Open Education Faculty, due to its institutional growth and breadth of scope, it has turned into a centralized and protective structure where rules and regulations are more clearly drawn. In a way, an institutional development took place that added control culture to the initial cooperation culture. "*There is more protectionism every day than in the past.*" (K5). Another participant explained protectionism as "*because the system is big, a small change can have big results just like the butterfly effect. For this reason, managers are trying to protect the institution from risky steps.*" (K6).

As to Miles & Snow's organizational culture types, it is seen that the developing and analytical culture types come to the fore in Anadolu University Open Education Faculty. The institution, which is known to be the first institutional implementer of distance education activities in Turkiye, is a pioneer in this context and has been capable of taking courageous decisions and making new breakthroughs. The newly opened departments and programs, the efforts to expand the scope, the efforts to create strategic cooperation are among the decisions that have resulted in organizational development and growth. In this context, a structure that is a pioneer in change and taken as an example by other institutions has been reached. *"Many exemplary practices and firsts for distance education, such as the first use of television in education in Turkiye, were experienced here.*" (K3). "*At the beginning of 90's exam organization was taken over by the university itself for the first time. That was a very significant step in the development of the system. Countrywide exams were administered for the first time. Computer infrastructure was developed. Printing press system was constructed, and all these are proof that the organization is constantly in an effort to improve itself.*" (K4)

The existence of a developer culture is reflected in another participant's remarks: "*While many things are not yet known in the field, Anadolu University Open Education Faculty filled the important conceptual gap here and set an example in this respect.*" (K6). With the increasing competition over time and the growth exceeding the borders of the country, it is seen that there is a return to the analytical culture as a result of the combination of the developer and protective culture in the institution. Pilot applications and SWOT analysis meetings which are held before decisions are made to keep success high and reduce risk, are the results of this effort. "*Exam information meetings are held to observe and solve problems. The structure of these meetings is continuously improved after pilot meetings are held… Anything is piloted before it is put into practice*." (K5).

Considering the Anadolu University Open Education Faculty in terms of organizational culture types of Kono, it is seen that it started with a leader-oriented dynamic culture but a bureaucratic culture became more affluent over time. In the first years of the faculty's establishment, because social distance was lower, horizontal and vertical communication were seen together. In addition, the creation of an atmosphere that gave employees a feeling of family rather than an institution supported the dynamic culture, while the influence of the founding leader Yilmaz Buyukersen was strongly expressed. Both academic and administrative staff mentioned that they followed the instructions by trusting the founding leader. The statements that refer to the efforts of Yilmaz Hoca in the establishment of the faculty, the establishment and training of the teams, and the effects on the establishment of the working system are the findings that underline the leadership effect. On the other hand, participants also drew attention to the dynamic culture that has emerged in addition to the leader-oriented culture. "*There was excitement during its founding years. There were groups that were constantly chasing new jobs, pursuing projects, pursuing research, and chasing innovation*." (K2). The leader influence was emphasized by K3 as "*The design and planning of Open Education Faculty started during Yilmaz Hoca's time.*" "*As well as university management, faculty from other universities who supported the content of the programs, television, and The Central Examination Agency have been other factors influencing the organizational culture. Developments in the ICT and the widespread cooperation of all academic staff in all universities in exam administration are other factors making the organizational culture unique*." (K4)

Over time, with the establishment and institutionalization of the organizational form of the faculty, a bureaucratic structure dominated by rules and procedures began to emerge. Anadolu University Open Education Faculty, as an institution operating on a massive scale, has gained a central cultural structure that reduces the risk of error and embraces a more controlled development scheme with this structure that brings standards. "*After determining the work flows in general terms, the process progresses with the protocols and contracts made*." (K6). *"An inventory for tasks of the personelle was created. After those roles and*

responsibilities were reorganized." (K4) "*Standards emerge as opinions of internal and external stakeholders are collected. We value feedback that comes from external evaluaters such as ones who give accreditation and quality certificates*." (K1)

Findings reveal increased bureaucratic functioning through hierarchical flow and resource management in the recent years. The influence of quality and accreditation processes that the faculty and its certain departments have been going through with the pressure of internal and external stakeholders is apparent in the development of a more controlled bureaucratic culture scheme.

DISCUSSION

For the discussion of the results of the findings shared above, firstly, the themes under the research question to reveal the elements that make up the organizational culture are mentioned. In the leader category, the founding leader of the Open Education Faculty, Prof. Dr. Yilmaz Buyukersen stands out as the main figure. Yilmaz Hoca, who developed an idea inspired by the British Open University 16 years before the open education faculty was established in Turkiye by considering the needs of the country in higher education, is a leader figure who has been able to effectively convey his vision to his colleagues and stakeholders around him. For this purpose, culture displays a transformative leadership as it plays a role in the construction of institutions, laws, fundraising, public opinions, human resources and organizational structures. Kocel (2014: 592) advocates that leaders have a vision and make their followers accept this vision and that transformative leaders prepare institutions for change and renewal. A transformative leader also impacts the employees, increases their excitement, raises their self-confidence and increases the level of commitment to the goal. Yilmaz Hoca has been found to have had a very significant role in the emergence and shaping of the organizational culture that has been shaped over the years for the Open Education faculty, and also on the adoption of this system and culture by the employees. The contribution of his and other founding figures' leadership should not be denied in the perception of 'open education' as a big family by the participants. Hellirieger et al. (1999: 616) also mentioned the qualities sought in an ideal leader as flexibility, taking initiative, being innovative, taking risks, analytical thinking, willingness to work, giving importance to quality, and being result-oriented on organizational effectiveness and a strong cultural structure; stating that under such leadership members adopt a loyal family spirit.

Another important element that builds culture within organizations is stories that are conveyed from person to person through oral transmission and strengthen the sense of belonging and adoption in employees. When we look at the history of open education, many firsts and the rapid restructuring ability after the establishment are the prominent aspects of the institution in the stories told. Stories about the efforts to prepare mass education materials for a higher number of students than expected, overcoming major exam organizations, multi-dimensional training of qualified human resources, bringing together the leading professors of the country with students, the establishment of the first color television studio, and efforts to solve the resource shortage have left their mark on the history of the institution as stories of them are constantly being told. These stories from the past of the institution have a crucial role on the ability of the Open Education Faculty to carry out mass education activities regularly and without errors, its ability to adapt to innovations and flexibility, and also its fast restructuring power. The effect of lived stories on employee behavior is expressed as being a bridge between the past and the present (Unutkan, 1995). Similarly, Gordon (2002) mentioned that stories serve as a guide for the wider diffusion of culture and values and understanding organizational activities. In Open Education faculty, the stories emphasized by the participants focus on operational affairs and success stories, conveying the functioning of the institution and at the same time fulfilling the duties of making new members adopt the culture.

One of the most important carriers of cultural transfer in institutions which is discussed within the scope of the research is organizational language. When we look at the 40-year history of the Open Education Faculty, it is seen that the terminological language of the open and distance learning discipline and the ways of doing business used in the organization has developed over time. The unique language used among employees both in administrative or academic positions started to emerge with the translations of the British Open University and other foreign resources, but has naturally developed and widely accepted today thanks to academic studies, theses, publishers, international conferences, course materials, collaborations and protocols. The

faculty has an alive and in-use language shared with all its units and staff. In addition, applications such as dictionaries, databases, archive systems are used to protect this language and transmit it to the future. The formation of the language in the Open Education faculty and the effort to protects it can be considered among the most important indicators that the members of the organization have adopted a common culture. In this regard, Robbins (1987, p.367) considers the use of corporate language by employees as an indicator for cultural adoption and an important effort for the preservation of organizational culture. When we look at how language is perceived in open education faculty, it is seen that academic terminology is mentioned rather than administrative processes, which is in line with Bailey (2004), who emphasizes that the culture in universities traditionally has an academic discipline-based content and language.

One of the most nurturing elements of culture is daily work routines. These routines, which we call rituals, are one of the elements that are taken for granted as they are repeated, taught and transferred to new members by the employees. In our findings there was an emphasis on administrative rituals related to operational activities. Book writing, preparation and shooting of television programs, exam question development, meetings and studies related to exam organizations are among the organizational rituals frequently encountered. In addition to these, there are routines related to administrative affairs and academic studies. In this context, the Open Education Faculty is an institution that applies the multidimensional business culture in its work routines. Herguner (2000) stated that cultural ideological systems in academic institutions occur at three different levels: corporate culture, professional culture and academic discipline culture. It is seen that work routines that support culture are shaped at all these levels at the same time in an inseparable way in Open Education faculty. In addition, although it has an organizational structure that is divided into units today, it is noteworthy that the institution still maintains working routines that carry out operational, administrative and academic affairs together.

Another cultural element that constitutes the organizational culture and is discussed within the scope of the research is values. Values that came primarily out from the findings are knowledge, reliability and lifelong learning whereas technology, innovation, quality and R&D also stand out among the values that aim to improve the service offered. As an institution that has broken grounds and managed to update its scope and technology infrastructure since its establishment, these values are protected and cultural transfer is taken care of. Another value that draws attention in the findings is the concept of human focus, which represents the priority of providing equal opportunity in education. For the open education faculty, which strives to provide education services to individuals from different segments of the society, human-orientedness is also seen among the values carried to the present day. Considering values, it has been determined that the officially announced values that are given importance in the promotion of the institution and the operational values that are effective on the ways of doing business might not always be in harmony with each other (Thevenot, 1986, p.96). In our findings, prominent values of the Open Education Faculty embraced by the members are parallel to official values stated and operational values coincide with Wiener's (1988) functional organizational values.

In the theme of ceremonies in which organization-specific celebrations and activities are handled, learner-oriented activities such as graduation and certificate of achievement ceremonies are expressed as priority in the codes that stand out for the Open Education faculty. The symbolic value of graduation is the bond it establishes between the teacher and the learner. Graduation ceremonies have become a tradition in the open education faculty, as the closeness between faculty members and alumni and their relatives is considered important. Smart and Hamm (1993) refer to the morale of faculty and learners and that focusing on external environment relations can strengthen the cultural effectiveness of higher education institutions. In this respect, the emphasis on graduations shared by the faculty members, learners and administrators of the Open Education faculty can be evaluated as empowering the culture. Activities that strengthen the bond of employees with each other and with the institution are as important as the learner-teacher interaction. Erdem and Isbasi (2001) state that the academic workforce is the dominant subculture for the cultural codes formed in university institutions. Bazzi (1999) also stated that the academic workforce adopts the organizational culture more thanks to organic interactive organizational structures that faculty members share with each other. Therefore, meetings, meals and feasts that support the organizational culture among the academic workforce also strengthens the bond between many offices, provincial coordinators, and representative offices of the open education faculty, which operates in a very wide geographical area. Ceremonies that bring

together employees from different provinces and even countries provide valuable contributions in terms of acting in coordination, owning a common purpose, speaking the same language, solving problems together, celebrating successes together, instilling a sense of belonging to the institution. This is seen as one of the main factors behind the open education staff's definition of the institution as a big family.

Another important element for organizational culture is symbols. Open education faculty is an institution that has many visual, printed and audio materials that could be taken as symbols themselves and are rich in symbols. In all of these materials, the most important symbol emphasized in the institution's web page, representations, exam documents, office materials and official correspondence is the logo of the institution. Looking at the history of this logo, it is noteworthy that the drawing was consciously shaped, and that the image aimed to represent the concepts supporting the mission and vision statements. In the details of the logo, it can be stated that the emphasis is placed on the local to the universal; and a visual that emphasizes the concepts of solidity and strength with its colors is preferred. It is seen that the open education faculty, which does not have a separate logo from the university, has used a logo integrated with the university by writing the faculty name under the larger institution logo. In this case, the logo is repeated more often symbolically, and it has left deeper traces in the minds of all internal and external stakeholders. The Faculty revised the logo once in a 40-year period with an aim to emphasize renewal and transformation by changing the color and writing style of the existing image, but a short time later, the old logo was readopted. When the participants were asked which logo they liked, the first logo common answer was given, and the effect of the established symbols on the employees stood out in the institution. In this context, the power of the symbolic value created by the logo for the open education faculty and the intensity of adoption can be expressed as supportive for the corporate culture. In Rafaeli and Worline (1995, p. 5), the indicator of successful symbols is explained by the unifying feature on the members of the organization. When the symbolic elements are mentioned, open education television programs, book designs, many audio and visual materials come to mind, and it has been determined that the building in the campus has a symbolic meaning. In the findings, it was emphasized that the architecture of the other buildings on the campus was different by expressing that it symbolized technology and innovation. In this regard, James (1997, p.85) argues that symbolic value can be created for culture with building forms and spatial distributions in organizations. As an institution that solves the mass higher education service with the support of technology, a connection is established between a modern and innovative building architecture and working style, far from the classical style apparent in the rest of the campus buildings. Using the architectural symbolism advocated by Willis (1996) in this regard, the open education faculty adopts an understanding that symbolizes a certain way of thinking and instills a sense of belonging to the employees with its building shape, building materials and style.

When we evaluate the research findings in terms of cultural types, the first heading that comes to the fore in Schneider's typologies is the culture of cooperation. The cooperation of many units such as testing unit, learning technologies research and development unit, computer technologies development unit, provincial offices and TV production units is essential due to the workload and work tempo of open education. Collaborative culture, as Schneider (1988) states, focuses on the experience of employees and the benefits they offer. Strengthening informal communication in the face of workload and supporting organic structures can also be seen among the indicators related to this culture. Although the institution has expanded its scope and activity content over time, it still acts in cooperation. However, it is noteworthy that today, a protectionist perspective has been added to the culture. As an institution providing mass higher education services, this is a natural result. The fact that the open education system has a settled and large structure requires multidimensional thinking of the decisions taken. Akin (2013, p.43) is one of those who argue that the controlling culture is seen more in large production and service enterprises. Open education faculty tries to prevent confusion and errors by providing control from a single center with the protectionist approach brought by growth. Before making a decision within the scope of the faculty, establishing the cause and effect relationships correctly, predicting risks, conducting meetings and pilot studies so that the system can operate without errors are practices that strengthen the protective culture. In this way, reliability in educational activities, which is an important organizational value for open education, is maintained.

Considering the organizational culture typology of Miles and Snow within the scope of the second research question, it can be stated that the prominent culture types for the Open Education faculty are the developing and analytical cultures. As an innovative institution that has been adding new programs and curricula since its

establishment, raising multidimensional human resources, finding formulas for lack of resources, enlarging its target audience with strategic protocols, pioneering the firsts in technological investments and continuing its transformation, Open Education Faculty is an institution where development is constantly supported. For this reason, it can be stated that the developmental organizational culture is seen as dominant. The transformation from a small university to a mega-university reaching millions of learners has taken place through the developmental efforts of the open education faculty culture (Daniel, 1996). Considering the responses from the participants in the research, it is noteworthy that more cautious steps have been taken in the transitional decisions with the growth of the institution over time, the expansion of the geographical scope, and the massive number of learners. When a change occurs under the influence of internal or external dynamics, instead of making immediate decisions, organizing search meetings, conducting preliminary research, conducting pilots, and taking new steps with the coordination of all relevant application units is an indication that the analytic culture has become widespread in the institution. Karaca (2022) considers analytic culture as a combination of developer and protective culture. The effect of the protective style on the previously prominent cultural types for open education has been mentioned. Emphasis is also placed on elements of a developer culture. For this reason, it is usual for the Open Education Faculty to reflect the analytic culture, which represents the combination of both types of organizations, as the faculty culture. Eren (2008) claims that analytic culture focuses on balance and change. While balance is an effort to create formal structures in the institution and increase the effectiveness of existing activities, change means adapting to environmental conditions and developing a cautious strategy. Open Education Faculty continues its development with cautious strategies due to the size of the institution. In order to support the developmental aspect of the analytic culture in the faculty; as Patt and Margarit (1999) stated, employees should be convinced of the possibility of success, research support, and supportive social norms within the organization. Thus, the developmental aspect of the faculty can be strengthened.

When we look at the organizational culture types of Kono, it has been determined that Open Education Faculty started its activities with a leader-oriented dynamic understanding, and then it shifted towards a bureaucratic culture with the effect of growth and institutionalization over time. Open Education faculty has a leader-oriented foundation story. The faculty started its activities as an institution that Yilmaz Buyukersen started as an idea and took preliminary steps for its foundation as a president of a small and newly established university in the 1960's. In addition, the influence of him as a leader on many critical issues from the design of the corporate logo to the structure of the studios, from the architecture of the buildings to the way they operate daily is acknowledged by the participants. Kose et al. (2001) consider the effective use of symbols in the formation of culture as one of the important skills of leadership. In this context, as Alvesson and Berg (1992, p.16) stated, Yilmaz Hoca has become a name that acts with the necessity of the leader to produce and work with symbols. In addition to this leader-oriented culture, Open Education faculty also maintains a dynamic culture that produces accurate information rapidly, maintains its reliability in error-free examination organizations, and continues its development in terms of human resources, infrastructure and academics, as well as its leading influence. Independent learning approach that has grown to be a recent prominent value in higher education has also asserted a dynamism into the system due to efforts to integrate quality standards and processes. However, when we look at the transformation of the Faculty over time, the power of a single decision to affect the whole system, the clumsiness brought by size and the pressure to keep the risk of error under control have led to a bureaucratic structure where the authority and responsibility flow is defined, the central management style comes to the fore, and the regulations and procedures are clearly drawn. In this case, it is normal for bureaucratic mechanisms to develop as well as dynamic aspects within the organizational culture. In the study carried out by Erdem et al. (2011) it was revealed that the type of culture that the personnel in academic institutions see in their organizations is more hierarchical and control-oriented structures, but what should be is a dynamic, flexible culture that is strengthened by cooperation between employees. Open education faculty has been established with a dynamic structure, which is seen as ideal in this context, and has turned into an institution where bureaucratic tendencies have become widespread over time. However, despite its size, it maintains its closeness to the ideal structure due to its flexibility to respond quickly to environmental changes and its cooperation culture.

Of types of organizations in general, it is seen that Open Education Faculty with a history of more than 40 years is far from a static culture. Instead, it is a dynamic institution that has adopted collaborative and

continuous work as a cultural code. The transformations experienced due to search for innovation and growth are an indication that the organization is culturally strong in terms of the developmental dimension. In time, as the open education faculty increases its geographical scope, target audience and number of programs with continuous growth, it has become more careful to take innovative steps. The faculty has gained a more bureaucratic structure due to the correct use of resources, anticipation of risks, and expansion of the area of control. This situation causes the institution to evolve towards a culture that approaches the process of making new decisions analytically and thus to protect itself from threats.

The organizational culture of Anadolu University Open Education Faculty is not shaped on a single dimension. Many aspects such as the founding leader, academics, administrative staff, managers who took part in the history of the institution, administrative units, institutions with strategic cooperation, the state, learners, scientific conferences, institutional events and ceremonies have touches on the faculty culture. As a world university that first realized distance education in Turkiye and has been successfully continuing it for more than 40 years, the organizational culture of the faculty can be considered as settled, flexible, dynamic and cautious after institutional growth. It is possible to evaluate the organizational culture of an open education faculty which provides mass education services and has such a large scope, in terms of its unifying effect on internal and external stakeholders and the level of adoption of tangible and intangible cultural elements.

CONCLUSION

Organizational culture is a concept that makes institutions an institution and adds spirit to the structural system. Culture, which connects resources and inspires the motivation to act together towards a common goal, is in a position that affects the functioning at many macro or micro levels. Within the scope of this study, the concept of culture, which is discussed at the level of academic organizations, has been analyzed within the context of Anadolu University Open Education Faculty. The categories that emerged within the scope of the content analysis carried out are grouped under two headings: elements that build culture and types of culture. In the category of elements; leader, stories, language, rituals, values, ceremonies and symbols were analyzed and in terms of culture types Schneider, Miles and Snow and Kono's typologies were included. As a result of the analysis, it was found that that Anadolu University Open Education Faculty has a strong leadership effect on its culture. Findings reveal that Yilmaz Buyukersen's leadership played an active role in the establishment of the faculty's culture and it still has significant influences. Stories of hard and devoted work during periods when faculty resources were insufficient highlight the prominence of the culture of cooperation. Today, these stories from the past being told to new members are effective in the systematic, error-free and collaborative continuation of the work. It has been determined that academic and professional terminology has come to the fore and tried to be protected instead of an institutional language in the organization. Institutional rituals are mostly seen in operational activities related to work processes. Since the faculty has a work-oriented structure, organizational values that prioritize the work done have emerged. It is noteworthy that in the ceremonies, those who teach and learn as the important parts of the subculture in academic institutions are given priority. For this purpose, within the scope of open education faculty; many organizations are held, from graduations, events, festivities, to meetings that bring together provincial representatives and offices. It is thought that the Open Education Faculty, which is a geographically comprehensive institution, strengthens the communication flow and coordination skills it provides between employees and units in different spatial conditions, by sustaining these traditional activities. When we look at what has become symbols for the Open Education Faculty, the logo, television programs, book designs and the building architecture in the campus are among the prominent topics. When the typologies in cultural studies are examined, it is seen that there is no stagnant and stable culture in the institution. Instead, there is a cultural structuring that is dynamic, with a leader effect, and where development is continuous with cooperation and hard work. When the faculty reaches a certain size and scope over time, it is seen that cultural types that are more cautious, more analytical and systematic begin to come to the fore. In conclusion; considering the success of the Anadolu University Open Education faculty in providing higher education to people from all ages and other characteristics, its stable development, its ability to adapt quickly to changing environmental conditions, its intra-organizational communication and coordination skills, it can be stated that the organizational culture it has is a strong culture adopted by its followers.

Suggestions and Recommendations

The organizational culture that brings the employees together in the process of achieving common goals has an advantageous potential for the institution in the process of achieving the future goals of the faculty. Anadolu University Open Education faculty, which has received significant influences in this context, can have the opportunity to add new ones to its achievements in the field of distance education and maintain its competitive advantage if it continues to use this power correctly.

Further research recommendations may include looking into certain aspects of organizational culture or faculty culture more specifically in open higher education institutions, such as faculty goal orientation or shared values among faculty members.

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AN EVALUATION OF TEACHERS' VIEWS ON OPEN EDUCATIONAL RESOURCES

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Received: 12/07/2022 **Accepted:** 24/08/2023

ABSTRACT

The objective of this study is to determine the ways in-service teachers in Turkiye make use of open educational resources and their opinions on using them. For this purpose, the explanatory sequential design has been employed. 588 teachers have participated in the quantitative part of the study; and ten have participated in the qualitative part on a voluntary basis. Data collection instruments have been (a) a personal information form developed by the researchers comprised of 16 questions and (b) a semi-structured interview form with 3 questions. The personal information form has been administered online to participants via social media. Whereas the interviews have been conducted using Zoom teleconferencing software. According to the findings, more than half of the teachers are knowledgeable on the matter of open educational resources and information resources consist of social media. It has been determined that female teachers make greater use of open educational resources than males. It has been established that the most significant affordance of open educational resources is the way it saves time and space for teachers, whereas lack of time and knowledge are the primary obstacles against using open educational resources. Additionally, the opinions of teachers show a demand from their employing organizations towards activities for raising awareness towards the matter of open educational resources and it has been shown that they wish to be encouraged on this matter. It has also been expressed that they expect quantitative and qualitative improvement of the resources provided by the Ministry of National Education, as well as support and cooperation on the use of open educational resources.

Keywords: Open educational resources, personal development, vocational development, teacher, OER.

INTRODUCTION

Notions involving education and teaching are among basic notions that have remained at the center of life since the existence of humanity. In contrary to past centuries, most of the educational activities in the 21st century is conducted in schools. The activities that take place in schools are based on a number of systems. Teachers assume valuable tasks regarding procuring the information and skills that are needed in addition to the responsibilities that are brought along by the said systems. The most significant of these tasks is to raise individuals, who will contribute to the society by way of ensuring that they attain necessary information (Ozdemir & Orhan, 2019). In addition to the skills that teachers acquire for themselves and their occupations, the society has some expectations from the teachers as well (MEB, 2017). Among these expectations remain the teachers' keeping track of their self-development on a continuous basis; additionally, the constant improvement of the quality of educational activities that they provide. It is considered that if the

teachers could respond to the said expectations, circumstances involving the development of the society in all fields will occur and education will flourish (Shohel, 2012). Furthermore, it is also expected that teachers keep up with the changing world as a requirement of the age they are living in. Consequently, the notions of personal development and vocational development that must be significant for all individuals today becomes a more critical condition for those who conduct the occupation of teaching. Similar opinions are explicitly specified in a policy paper that was published by The Turkish Ministry of Education (MEB) (MEB, 2017). As such, it seems that the most significant stakeholder of education that can improve the quality of education and ensure the development of society are the teachers.

Therefore, it can be claimed that the profession of teaching requires lifelong learning. Teachers must improve themselves continuously. With the purpose of facilitating the personal and vocational developments of teachers, some training programs have been launched by MEB. Nevertheless, MEB (2017) emphasizes that these educational activities may remain inadequate by themselves and that effort from teachers towards keeping track of their self-development using various methods is also necessary to move forward. At this point, the notion of Open Educational Resources (OER) becomes pronounced.

Educational materials that emerged alongside rapidly developing information technology for the purpose of overcoming conventional obstacles present in educational activities and contain traces of the notion of openness at the core are expressed as OER (OECD, 2007). MEB (2017) states that teachers may be kept away from in-service training and development activities due to various reasons (heavy workloads, financial reasons, health problems, perceived lack of quality in training activities etc.) and yet these now carry the opportunity to proceed with personal and vocational development by the way of open educational resources. Furthermore, since such materials may be reached over the Internet, access to information takes place in a much easier and quicker manner.

OBJECTIVE OF THE RESEARCH

During the COVID-19 outbreak across the world, educational activities in many countries have been conducted through a method named emergency distance education. The sudden change has caused all education stakeholders and primarily the teachers to keep track and make use of digital course materials. During this process, it is considered that the ratio of use of OER is increasing, and that this ratio will continue to increase soon. The objective of the present research is to examine the routine use of OER by in-service Turkish teachers with the purpose of furthering their personal and vocational developments and to establish their opinions on the use of these. In this context, the research questions below have been formulated:

1. Are the teachers knowledgeable on the notion of open educational resource?
2. Which information sources do teachers use for learning about and staying relevant with open educational resources?
3. Which open educational resources are in use by the teachers with the intent of personal and vocational development?
4. What are the possible obstacles against the use of the open educational resources with the purpose of personal and vocational development?
5. On what platforms do teachers share the digital course materials they create with the intent of these being used as open educational resources?
6. Do the condition of usage of the open educational resources by teachers with the purpose of their personal and vocational development depend upon teachers'
    a. Gender,
    b. Age,
    c. Years in profession,
    d. Educational background,
    e. Branch,
    f. Level of school in which they work,

g. Task at school in which they work,
h. Type of school in which they work,
i. Location in which they work.

7. What benefits do open educational resources provide for the personal and vocational development?
8. What are the expectations of the teachers from their employing organizations to execute with their personal and vocational developments using open educational resources?
9. What are expectations of the teachers from MEB for them to execute with their personal and vocational developments using open educational resources?

This research limited to

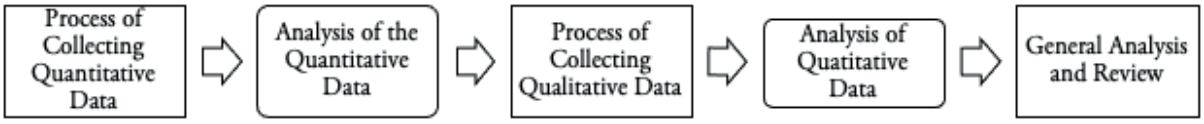
- 2021-2022 academic year,
- teachers from all branches working in public and private schools affiliated to the MEB,
- collection instruments prepared by researchers.

METHOD

Research Model

The present research follows a mixed research method, which involves both quantitative and qualitative research patterns (Creswell, 2012). Mixed research has been chosen as a method with the goal of obtaining profound information relating to the study and to offer solutions to the expressed research problem in a more detailed manner. In this context, this study follows the sequential design, which is one of the mixed research methods. In explanatory sequential design, the study is supported by a qualitative part to be able to explain the quantitative data collected by the researcher as well as the findings that have been obtained from the said data (Fraenkel et al., 2012). Details on explanatory sequential design has been given in Figure 1.

Figure 1. Explanatory sequential design (Fraenkel et al., 2012)



As part of the quantitative part of the research, descriptive survey model has been used. According to Buyukozturk et al. (2020), descriptive survey model investigates the peculiarities involving interests or skills on any matter belonging to the participants. Whereas, according to Karasar (2020), it is a model, which investigates any phenomenon that occurred in the past or continues to occur in the present.

As part of the qualitative part of the research, case study pattern has been used. In case studies, one or more than one situation or phenomenon is made a matter of extensive research (Yildirim & Simsek, 2016).

Participants

Teachers from various specialty fields, who were employees at either public or private K12 schools in Turkiye operating under authority of MEB during the academic year of 2021 – 2022 have been participants in this research. Through convenience sampling, 588 teachers have been designated as participants. The demographic data of teachers that participate in the research have been presented in Table 1.

Table 1. Demographic data of participants

Variable	Group	N	%
Gender	Female	367	62,4
	Male	221	37,6
Age	22-30	234	39,8
	31-40	246	41,8
	41 and above	108	18,4
Year of Seniority	0-5 years	230	39,1
	6-10 years	141	24
	11-15 years	92	15,6
	16 and above	125	21,3
Specialty Field	Information Technologies	208	35,4
	Others	380	64,6
Level of School	Kindergarten	23	3,9
	Primary School	84	14,3
	Secondary School	269	45,7
	High School	212	36,1
Task at School	Director/Assistant Director	51	8,7
	Teacher	537	91,3
Type of School	Public	482	82
	Private	106	18
Location of School	City center	192	32,7
	County	327	55,6
	Village	69	11,7
		588	%100

Qualitative data have been collected from ten teachers that work in various branches in either public or private schools under MEB in the school year of 2021 – 2022. Purposive sampling has been used for determining participants at the qualitative stage. The information on participants of the qualitative stage has been presented in Table 2.

Table 2. Information relating to the teachers that participated in the interview

Code	Gender	Age	Year of Seniority	Educational Background	Specialty Field	School Level	Task	Type of School	School Location
O1	Woman	29	0-5 years	Master's Degree	Social Studies Teacher	Secondary School	Teacher	Private	City Center
O2	Man	32	6-10 years	Bachelor's Degree	Information Technologies Teacher	Secondary School	Teacher	Public	City Center
O3	Woman	24	0-5 years	Bachelor's Degree	English Teacher	Secondary School	Teacher	Private	County
O4	Woman	31	0-5 years	Master's Degree	Information Technologies Teacher	Secondary School	Teacher	Public	City Center
O5	Woman	25	0-5 years	Master's Degree	German Teacher	High School	Teacher	Private	County
O6	Man	33	6-10 years	Bachelor's Degree	Information Technologies Teacher	Secondary School	Teacher	Private	City Center

O7	Woman	32	0-5 years	Bachelor's Degree	English Teacher	Secondary School	Teacher	Private	County
O8	Woman	31	6-10 years	Bachelor's Degree	Information Technologies Teacher	Secondary School	Teacher	Private	County
O9	Woman	27	6-10 years	Bachelor's Degree	Turkish Language and Literature Teacher	High School	Teacher	Public	County
O10	Woman	31	0-5 years	Bachelor's Degree	History Teacher	High School	Teacher	Public	County

Data Collection Instruments

Data were collected via a Personal Information Form and the semi-structured interview form both of which have been prepared by the researchers.

Personal Information Form

The Personal Information Form has been used for determining participants' demographic information and their ways of using OER. A literature review was conducted prior to creating the form and twenty-six questions, which were split into two parts, have been formulated accordingly. Expert opinions have been sought to establish scope validity once the form has been created. Experts were chosen from three scholars from the college departments of Computer Education and Instructional Technologies and 3 Information Technologies in-service teachers. Based on expert opinions, questions that were found to be out of scope have been removed. Linguistic validity of the form has also been sought by consulting the opinions of three in-service Turkish language teachers. A pilot implementation of the form has then been initiated with 21 teachers and no negative feedback has been received as a result. The form has thus been finalized.

Personal Information Form consists of two parts. The first part of the form comprises ten questions involving demographic information of participants, with eight questions being multiple choice; and 2 open-ended. These questions sought to reveal data such as gender, ages, years of employment, educational background, specialty fields, level of school in which they worked, tasks at schools in which they work, types of schools in which they work, and the location of the school. The second part of the form involved specifics on OER usage of participant. Here, six questions were concerning the state of awareness towards OER, ways of using OER and purposes of using OER. Whereas five questions have been multiple-choice in this part, 1 question has been open-ended. This part has sought to understand whether teachers were knowledgeable of the OER repositories available to them in Turkiye and how they had acquired the said information. It was also asked to participants the purposes for which they had made use of OER repositories (if ever) in the past, the possible obstacles they confronted while using OER (if any), whether they had published any course materials of their own design on any OER repository and; if they did, what the platforms were.

Semi-Structured Interview Form

For the qualitative part of the study, a semi-structured interview form prepared by the researchers has been used. Interviewing is a method useful for obtaining information relating to the experiences, the considerations, critiques, or feelings of individuals (Yildirim & Simsek, 2016). At the initial stage, 8 interview questions of have been formulated. These were shared with the same experts that also examined the Personal Information Form. As per the feedback received from experts, number of questions on the interview form have been reduced to three. Through this form, it was aimed to find out the opinions of participants on the potential benefits OER provided for their personal and vocational developments and their expectations from MEB or employing institutions in the context of beneficial OER use.

Before conducting the surveys and interviews, approval was obtained from Trakya University Social and Human Sciences Research Ethics Committee for both data collection instruments.

Collection and Analysis of Data

Collection of Data

To be able to collect data as part of the quantitative part of the research; primarily, the questions that take place in the Personal Information Form have been transferred to the digital environment using Google Forms application. After this, the form was shared with participants using social media platforms Facebook, Twitter, and Instagram. Furthermore, the form URL has been shared with online interest groups consisting of teachers.

For the collection of qualitative data, teachers that are knowledgeable about OER have been determined in the first place and requests of interview have been sent to these. Due to intense workload of teachers and COVID-19 measures in place, the decision was made to conduct interviews using Zoom teleconferencing software.

Before the administration of the data collection tools, necessary permission was obtained from the Kirklareli Provincial Directorate of National Education.

Analysis of Data

For the quantitative part of the study, data have been analyzed using SPSS 26.0 software package. In addition to descriptive statistics, chi square tests have been used for analyzing quantitative data therein.

As for qualitative data, the method of content analysis has been used. The main objective of content analysis is to gather up the similar data in the framework of the common themes and to present the said themes in a way that the readers (Yildirim & Simsek, 2016) can comprehend them. At the phase of the content analysis, the replies that were given by the two specialists, one of whom is the researcher himself and the other the field specialist relating to the topic, have been examined and coded. The replies that were given by 10 teachers in response to three separate questions have been coded one by one and then the codes belonging to the specialists have been compared and the themes on which a consensus was reached have been compared. In the case of the coding made one by one, the harmony between the two coding has been calculated using the formula that had been suggested by Miles and Huberman (2019) (Number of consensus/Total consensus+ difference of opinion); the coefficient of concordance between the coders has been found out to be 90%. Then, the two experts have studied together upon the coding and the conclusion has been derived that the two experts agree with one another. Upon the preparation of the final themes, a consensus has risen to 100%.

FINDINGS

Whether 588 teachers that made a participation in the research are knowledgeable or not on the notion of OER has been investigated. Table 3 shows relevant findings.

Table 3. The frequency values relating to the situation as to whether the teachers are knowledgeable or not on the notion of OER

Are you knowledgeable on the notion of OER?	f	%
Yes	402	68,4
No	186	31,6
Total	*588*	*100,0*

The question of how the teachers came to possession of the related information if they are knowledgeable of the notion of OER has been asked and it was requested to pick from a list of options. The findings have been presented in Table 4. As this question has allowed teachers to select more than one option, the total frequency values do not present the total number of participants.

Table 4. The frequency values relating to the sources of information of teachers who are knowledgeable on the notion of OER

Information source relating to the notion of OER	f	%
Social media posts	302	75,1
Courses received during college education	168	41,8
Colleagues	212	52,7
Supervisors	37	0,9
Students	28	0,7
School parents	7	0,1
Web sites or blogs dedicated to the topic	153	38
Participated In-service trainings sessions	139	34,6
Participated Academic seminars/conferences	127	31,6
Books/journals	83	20,6
Activities of non-governmental organizations	54	13,4

The question as to whether the teachers made use of OER for the purpose of their personal and vocational developments has been put forward. The outcome has shown that 508 teachers made use of OER, whereas eighty of them did not. Subsequently, the teachers that have given responded that they made use of OER have been provided with fifteen various OER repositories and have been asked about the types of resources they made use of together with the intent of using those. Findings have been presented in the Table 5. Again, the teachers may have made more than one response to the given question and the total frequency values therefore do not indicate the total number of participants.

Table 5. The frequency values belonging to OER that the teachers made use of for the purpose of their personal and vocational developments

OER	For the purpose of Vocational Development		For the Purpose of Personal Development		For the Purpose of both Vocational and Personal Development	
	f	%	f	%	f	%
MIT OCW	11	1,9	10	1,7	2	0,3
Connexions (OpenStax CNX)	5	0,9	2	0,3	3	0,5
MERLOT	5	0,9	6	1	3	0,5
OpenLearn	20	3,4	23	3,9	14	2,4
OER Commons	4	0,7	4	0,7	2	0,3
Khan Academy	84	14,3	48	8,2	76	12,9
YOK Course Platform	41	7,0	23	3,9	26	4,4
Educational Information Network (EBA)	259	44,0	20	3,4	205	34,9
Ankara University's Open Course Materials (ANKADEM)	28	4,8	20	3,4	11	1,9
Hacettepe University's Open Course Materials (HUADEM)	16	2,7	12	2,0	8	1,4
Middle East Technical University's Open Course Materials (METU ADM)	27	4,6	12	2,0	17	2,9
Bilgeis	28	4,8	15	2,6	24	4,1
Cizgi Tagem	55	9,4	17	2,9	32	5,4
BTK Akademi	65	11,1	26	4,4	67	11,4
Distance Education Gate	116	19,7	23	3,9	73	12,4

The type of obstacles that stand against their usage of OER for the purpose of their personal and vocational development has been asked and 503 teachers have responded the question. Findings have been presented in Table 6. The question allowed the choice of multiple answers, and the total frequency value therefore does not indicate the number of participants.

Table 6. The frequency values belonging to the possible obstacles before the usage of OER by the teachers

The possible obstacles that stand before the usage of an open educational resource by the teachers	f	%
"I have an issue of internet bandwidth quota."	42	8,3
"I cannot allocate the necessary time."	317	63
"I do not have the necessary knowledge to use them."	182	36,2
"I consider the usage of an open educational resource unnecessary."	5	0,1
"I do not find open educational resources useful."	8	0,16
"I do not find the content of the open educational resources reliable."	10	0,2
"I have not been encouraged to use OER by my supervisors."	105	20,9
"I believe the usage of an open educational resource is a difficult chore."	16	0,3
"I cannot find an open educational resource aiming at my specialty field."	80	15,9
"I cannot find an open educational resource aiming at my hobbies."	37	7,4
"I do not possess adequate knowledge of a foreign language in order to make use of the non-Turkish open educational resources."	125	24,9
"I believe my literacy of technology is inadequate."	88	17,5
"I consider the in-service training programs to be inadequate."	171	34

The participants have been asked question of whether they made ready any digital course materials of their own design at domestic or global OER repositories. According to the findings, only 67 (11,4%) of the teachers created their own digital materials for use in OER platforms; whereas 521 (88,6%) have stated that they did not. The teachers, who had created OER materials, have been asked about the types of platforms they shared their created content. Fifty teachers responded and the results have been presented in the Table 7.

Table 7. The frequency values belonging to the platforms through which the teachers who make ready a digital course material make a sharing

The platform on which the digital course materials are shared	f	%
EBA	42	84
Kahoot	2	4
Scientix	1	2
Udemy	1	2
Wordwall	1	2
girisimciogretmen.com	1	2
Edebiyat TV	1	2
e-Twinning	1	2
Total	**50**	**100 %**

The state of OER usage by the teachers have been put to examination from the angle of the variables involving gender, age, year of seniority, educational background, specialty field, the level of school they worked in, their tasks in the said school, the type of their school, and the location of their school. The findings that have been acquired have been presented in the Table 8.

Table 8. The chi square results of the state of OER use by teachers depending on the related variables

Yes		The State of OER Usage					
		Yes	No	N	X^2	Sd	p
Gender	Woman	328	39	367	7,371	1	.007
	Man	180	41	221			
Age	22-30	204	30	234	0,211	2	.900
	31-40	211	35	246			
	41 and above	93	15	108			
Year of Employment	0-5 years	196	34	230	3,531	3	.317
	6-10 years	124	17	141			
	11-15 years	84	8	92			
	16 and above	104	21	125			
Educational Background	Bachelor's Degree	351	66	417	3,031	2	.079
	Master's Degree	147	13	160			
	Doctoral Degree	10	1	11			
Specialty Field	Information Technologies	178	30	208	0,183	1	.669
	Other	330	50	380			
Level of School	Kindergarten	19	4	23	1,076	3	.783
	Primary School	75	9	84			
	Secondary School	233	36	269			
	High School	181	31	212			
Task at School	Director/Assistant Director	45	6	51	0,161	1	.688
	Teacher	463	74	537			
Type of School	Public	412	70	482	1,914	1	.166
	Private	96	10	106			
Location of School	City Center	171	21	192	2,831	2	.243
	County	281	46	327			
	Village	56	13	69			

As is evident from the Table 8; according to the result of the chi-square analysis that was made in order to determine whether there is any difference in between the state of OER usage for the purpose of their personal and vocational developments and their genders, a significant difference has been found statistically in between the state of OER usage and the variable of gender (χ^2=7,371, p<0,05). Upon examination of the related values, it may be stated that the women make use of OERs far more for their personal and vocational development in comparison to men. Nevertheless, No significant difference has been found in between the state of OER usage and the variables of age (χ^2=0,211, p>0,05), year of employment (χ^2=3,531, p>0,05), educational background (χ^2=3,031, p>0,05), specialty field (χ^2=0,183, p>0,05), the level of the school where they work (χ^2=1,076, p>0,05),the task at the school χ^2=0,161, p>0,05), the type of the school (χ^2=1,914, p>0,05) or the location of school (χ^2=2,831, p>0,05).

The study proceeded to investigate the types of potential benefits OER usage has yielded for the personal and vocational development of the teachers. An interview has been conducted with ten teachers for answering this question and the related results have been examined using content analysis. Findings acquired have been presented in Table 9.

Table 9. The opinions of the teachers aiming at the benefits that the OER usage provides for their personal and vocational developments

Themes	Frequency	Exemplary Situation
Saving on Time and Space	6	O8: *We may sometimes have difficulty in face-to-face participation in the courses because of workload, the rush in daily life. Nevertheless, I can say that the OER may reduce the happening and the possibility of happening of the said difficulties. The sites that present OER provide related resources and videos relating to many fields in which I am willing to improve myself both vocationally and personally for me. Moreover, thanks to the OERs, I can arrange the training that I wish to receive, the resources that I wish to make use of or the videos that I wish to watch in line with my own time and order together with my workload. The idea of self-development by way of benefiting from the large information on the internet without getting restricted in the sense of time and space seems desirable and provides me with many benefits as I have already stated.*
Up-to-Dateness	4	O1: *The OER ensure that the teachers get informed on the current studies in their own fields. In the end, everything changes instantaneously depending on the technology, it must be kept track of on a continuous basis. The OERs is an opportunity for this reason.*

As is evident from the Table 9; the two basic opinions on the benefits of the OER usage have been collected under the two basic themes. The themes are made up of a) saving on time, space, and b) up-to-dateness. The entirety of the teachers with whom an interview has been conducted; have managed the benefits brought along by the OER in the form of personal and vocational. 6 of the teachers have delivered opinions under the theme of saving on time and space and have made the statement that the greatest benefit that is brought along by the OER in the form of personal and vocationally is the accessibility of the trainings and information without being depending on the time and place while you are short of time. Whereas, under the title of up-to-dateness being the other theme, 4 teachers have delivered their opinions. The teachers have stated that the greatest benefit that is brought about by the OER is the accessibility of the current information; as a result, they could perform up-to-dateness of themselves rapidly and with ease, both personally and vocationally.

The type of expectations that the teachers have relating to their employing organization to continue with their personal and vocational developments through the OER have been made a matter of research. The opinions that have been acquired from the teachers on this matter have been presented in Table 10.

Table 10. Opinions relating to the expectations that the teachers have from the organization where they officiate aiming at the usage of the OER

Themes	Frequency	Exemplary Opinions
Awareness	6	O6: *Aiming at the teachers without some knowledge on the OER, cooperation may be established on a local basis meaning that through the national education directorates of provinces and counties, and distance education have to be held instead of having an expectation from the ministry in any case. As a result, the said OER or platforms may get promoted. As the recognition of the resources grows following the promotions, the usage level of the AKE will increase as directly proportional.*
Support/ Encouragement	4	O2: *The administrators must do the referrals that will ensure that the teachers will make use of such platforms. Moreover, he must take the lead by way of making use of it by himself.*

According to the Table 10; the expectations of the teachers from the organization where they officiate on the matter of OER have been collected under two themes. The themes consist of a) awareness and b) support/ encouragement. 6 out of 10 teachers have shared opinion under the theme of awareness and they have made the statement that they expect that groups of communities that give information upon the description of OER, the manner of their usage, the way they can be prepared all of which can boost the awareness of the teachers, should be established throughout meetings or seminars. 4 teachers have shared opinions under the theme of support/encouragement. These teachers have made the statement that they expect that the support and encouragement are required to ensure the usage of OER as well as their sustainability.

The related expectations of teachers from MEB through the OER to continue with their personal and vocational development have been investigated. Findings t based on content analysis have been presented in Table 11.

Table 11. Opinions relating to the expectations of the teachers from MEB aiming at the OER usage

Themes	Frequency	Exemplary Opinions
Quantitative and qualitative improvement of resources	7	**O9:** *EBA provides a field of vocational development; nevertheless, if you ask about its adequacy, in my opinion not at all. Therefore, MEB must perform the promotion and announcement of the resources that it established or will establish very well.*
Educational Support	2	**O6:** *I consider that as part of the online trainings that will be held, the promotion of the OERs that will be of use to our part can be made by the hand of the ministry meaning that, a single information known about by one person considering it too simple for himself may become a golden opportunity. Thanks to the said trainings, we will thereby provide the opportunity of disseminating an information belonging to an employee who is knowledgeable additionally.*
Cooperation	1	**O4:** *In my opinion, the matter of OER cannot be only just determined by MEB. A cooperation is required on the said matter. For instance, we are provided with many trainings; maybe the teacher is not in need of the given training or is not concerned with it. Moreover, he may have received the said training before; trainings are offered to us before receiving opinions, without putting forward suggestions at all. I consider that if MEB receives opinions of the teachers, it will be useful; this issue is valid for OER as well.*

According to the data given in the Table 11; the expectations of the teachers from MEB on the OER usage has been collected under three themes. These consist of a) a quantitative and qualitative improvement of resources, b) the educational support and c) cooperation. 7 teachers out of 10, who put forward their opinions, have stated that they have the expectation that the number of the present resources should be increased by MEB. The teachers have emphasized that the EBA platform is useful; nevertheless, lacking in certain aspects. Whereas, under the theme of educational support, 2 teachers have made the statement that they have expectation that a platform to be established on the matter of OER, information provided, and training sessions organized by MEB. One teacher has expressed the expectation from MEB towards cooperation with teachers upon OER usage.

DISCUSSION AND CONCLUSION

According to one findings of this study, it has been shown that 402 teachers out of 588 are knowledgeable on the notion of OER. These teachers gained their knowledge on OER from most prominently from social media posts, followed by their colleagues and undergraduate courses during their studentship. Being an OER repository, the Teachers Pay Teachers platform, which is used by 85% of teachers in the USA (Hahm, 2020), states that most of the teachers have heard about it on Instagram, a social media platform (Reinstein, 2018). This information is in line with the findings of this study and may indicate that the number of social network users, which is already high, has increased further during the pandemic and that social networks play an informative role.

However, 186 teachers stated that they have no knowledge about OER, which is still considered to be a high number. Based on this finding, it can be inferred that teachers need to be informed and guided about OER. Similarly, in the study conducted by Ozdemir and Bonk (2017), it was revealed that teachers had good knowledge about OER, but no research was conducted on how or where they acquired this knowledge. In addition, a study conducted by Peregrino et al. (2020) also obtained related results. According to their study, teachers' awareness levels about OER were found to be fair. Based on this information, it can be concluded that teachers in this study have also demonstrated a fair level of awareness about OER and refer to these sources for their development. In contrast, Baas et al. (2019) obtained different results in their research. The said study revealed that the level of knowledge on OER among university instructors was lower than expected, and as a result, participants also reported hesitation in using these resources. The main reasons for their hesitation could be potential difficulties in licensing or not receiving encouragement/appreciation from their colleagues or supervisors on the notion of using OER. On the other hand, Marin et al. (2022) emphasized that in some countries, such as Japan, K-12 teachers use OER at a higher rate than college level instructors.

Another outcome that has been acquired in the study is that more than one half of the teachers that had participated in the study are not only knowledgeable on OER platforms but are also actively using them. The teachers were asked about the purposes for which they have made use of the OER, and it has emerged that they have made use of the said resources mostly for the purpose of vocational development. This situation may indicate that the teachers are willing towards professional development. It has been shown that near one half of the teachers made use of the said resources not only for vocational development but also for personal development. Nevertheless, the ratio of usage of OER solely for the purpose of personal development amounts to 3,9%. The fact that teachers tend to use OER for professional personal development can be attributed to many reasons. One of them may be that the Ministry, to which teachers are affiliated, supports teachers more in the direction of professional development. Examples of these are the EBA platform being launched by the Ministry of Education in Turkiye exclusively for the use of teachers' personal development. Similar platforms have been reported in literature as Procomun for teachers affiliated with the Spanish Ministry of Education, Scootle for teachers from Australia, and Edutags in Germany (Marin et al., 2022). Research has been done upon the types of the OER platforms that the teachers have made use of for the purpose of their personal and vocational developments. Based on the findings; it was observed that EBA platform was far more popularly used in comparison with other platforms. Furthermore, teachers have also provided statements reporting that they were far more likely to use EBA for the purpose of vocational development. EBA in this manner has been followed by The Distance Education Gate, another platform the participants reported to using primarily for vocational development. A third entry in the most popular OER platforms list is the BTK Academy, which was also most likely used for professional development. Participant responses in this manner have been consistent with their answers to previous questions. Nevertheless, it has become evident that the teachers preferred domestic OER repositories to global (non-Turkish) ones. The usage ratio of platforms OER Commons, Connexions and MERLOT reflects this phenomenon. This may be due to either inadequate foreign language skills of teachers or the teachers not being referred to these global resources by administrative structures. As such, in response to the question related to the obstacles against OER usage, 125 teachers in this study have responded "I do not possess a foreign language knowledge enough to make use of global OER repositories." Consequently, it may be stated that the teachers expect foreign language support or at least a translation into Turkish of the said global resources. In addition, this finding also shows that there is a need for more OERs developed in Turkish. Cachia et al. (2020) and Ruiperez-Valiente et al. (2020) also emphasized cultural differences in the use of OERs and the importance of local OER production.

Another finding of the study has shown that the greatest obstacle standing between teachers and OER usage is a lack of time. Nearly all of teachers have agreed with the statement that they would be willing to make use of the OER if not for their heavy workload and lack of time in personal lives and that they could not find spare time for using the said resources. Furthermore, they have made the statement that even if they had spared time or had wished to spare time, there were not enough organized in-service training programs that would provide an opportunity for them to be engaged with OER. Additionally, sixteen teachers made the statement that it was difficult to make use of the OER. This finding is like the findings of Tang (2020) and Tang and Bao (2021). However, as part of the study that is conducted by Tang et al. (2020), a finding to the contrary has been acquired. As part of the latter study, the teachers have made the statement that the usage of the OER are not difficult at all and the factor of ease of use is correlated with the state of adoption of OER. Still though, as part of the interview that was made with Martin Weller by Koseoglu and Bozkurt (2018), it has been stated that the greatest obstacle before the OER usage and adoption is teacher awareness. Therefore, educational institution administrators are required to implement practices that increase teachers' awareness of OER, to increase the rate of adoption and use. For example, Katz and Van Allen (2020) and Morgan (2020) stated that librarians and instructional designers in educational institutions can help teachers use OER. Tang et al., (2021) also emphasized that school administrators and professional development experts should allocate time for assisting teachers in learning how to use OER. According to Koseoglu and Bozkurt (2018), it was stated that the quality of OER is also a controversy, and this is an important obstacle against their adoption.

Ossiannilsson (2021) also emphasized the importance of providing effective, inclusive, and equitable access to quality OER. In today's world, where information technology is intensely used, the production and

sharing of OER is as important as their usage. In this context, the current study also focused on whether teachers have prepared digital course materials for being shared over OER platforms and if they did, on which platforms they shared the said materials. According to the findings, it has become evident that only 11,4 % of teachers created digital learning materials to be shared over OER platforms; and the platform of choice for sharing these have mostly been EBA. As part of the research that was conducted by Bass et al. (2019), findings indicating that teachers are far more likely to create digital learning materials for their own personal accounts and not share them over OER platforms. In this context, it may be interpreted that the teachers need greater support not only in the production of digital course materials but also in the grasping the rationale behind sharing of the given materials, i.e., openness. The teachers with whom the researchers of this study have interviewed have also drawn attention to this situation. Similar findings have been acquired at a study conducted by Adnan et al. (2021). As part of the related study, the statement has been made that they need cooperation and vocational support at the point of the production and sharing of OER. Nevertheless, as part of the study that Kursun (2011) conducted with university instructors; the outcome that the academicians felt at ease and willing at the point of production of OER, without a need for external support, has been noted.

As part of the study, the state of the OER usage has been examined in respect with certain variables. It has become evident that female teachers made use of OER more as compared to their male counterparts. A similar difference is reported in a study that conducted by Adnan et al. (2021). However, as part of the latter study, the outcome that male university instructors made greater use of OER in comparison with female counterparts has also been shared. Based on these findings, it may be inferred that female teachers working in K12 schools, are far more concerned with using OER as opposed to female university instructors. Nevertheless, further research is necessary to test this claim.

State of the OER usage by teachers has been examined also in relation to age. It was expected that OER usage ratio of teachers between ages 22-30 would be making greater use of OER, owing to the inclination that they use information technology more prominently than their peers in previous generations. This expectation has not been reflected statistically. Moreover, it was observed that the greater number of participants in the study belonged to the 31-40 age group. In this context, no significant difference has been observed in terms of state of the OER usage based on teacher age. This finding may be interpreted as OER use being more dependent on other factors such as personal interest, perceived benefit, or encouragement by supervisors, which are all considered irrelevant of age. A study conducted by Adnan et al. (2021) has illustrated that university instructors at the age group of 46-55 and displayed marginally low incidence for both using or creating OER. Age factor therefore may still be a critical point of consideration in OER usage and production and yet; it should be considered that there exists a divide between senior teachers and their younger counterparts originating from the inclusion of the subject of OER in teacher training programs in the near past.

Years of employment as a teacher has been another variable that was examined. It has been determined that majority of the participating teachers have been employed between 0 to 5 years. Statistical analyses investigating a relationship between OER usage, and the year of employment has yielded no significant result. In other words, just as well as age, OER usage is not influenced by seniority as a teacher. In Adnan et al. (2021)'s study, it has been found that the state of the OER usage in university instructors with 0 to 5 years of employment has been found to be lower than that of instructors with greater level of professional experience. Such contradicting outcomes may have stemmed from the differences in group composition of the two studies.

Another variable that has been investigated for potential influence upon OER usage has been educational background. It has been theorized that a greater attainment of educational level would boost the awareness towards and hence, the state of usage of OER. However, majority of participants in this study possessed undergraduate degrees, with a few Master's degrees and even fewer doctoral degrees. With this group of participants, statistical analyses have indicated that OER use is not influenced by educational background A glance at the literature reveals contradicting results: in Peregrino et al. (2020), a medium-level positive correlation has been found between the state of the OER usage and educational background. It is considered that the root cause of contradiction may, again, be due to differences in group composition not only in terms of educational background but also in terms of knowledge, interest, and awareness levels on OER.

Specialty field has also been considered as a factor that may potentially affect state of OER usage. Although it has been theorized that a difference may exist between the state of the OER usage between information technologies (or, computer science) teachers as opposed to teachers from other specialty fields (math, science, literature, arts, etc.), no statistical evidence has been found to support this claim. The reason may be because participating information technologies teachers in the research being somehow less than the number of the teachers from other specialty fields.

The last set of variables that have been examined in relation to state of OER use have been a) the type of school, b) teacher's appointed task at the school c) the level of school and d) the location of school. No difference pertaining to the state of OER use has been found in any of the categories of these variables. Based on these outcomes, it may be interpreted that the state of the OER usage of the teachers does not matter whether they work in kindergarten, primary or high school; nor does it depend on the school's status as private or public, nor whether the school operates in an urban or rural setting nor if the participant is tasked with additional administrative duties or not.

In conclusion, the findings that are acquired within the scope of the present research and the examinations of the field literature indicate that although OER have been around for a long time; nevertheless, it was not until the COVID-19 outbreak that they garnered the attention they deserved. The fact that the number of academic studies conducted in Turkiye, which examine OER use is scarce is supportive of this claim. Considering that education is being reinterpreted in the post-COVID world, the significance of OER will be felt stronger than ever in the upcoming years. It is considered that individuals, who are willing to develop themselves, in professional capacity or otherwise, may make greater use of these resources in the future. This, in turn, will be supportive of lifelong learning activities of individuals in a natural manner. Therefore, it can be inferred that the need for countries, institutions, and individuals to closely monitor and adapt to the changes and developments will become a necessity. In this context, it can be said that there are significant responsibilities for the Higher Education Council and the Ministry of National Education in Turkiye to ensure that the importance of OER is felt by all segments of society. This way, societal awareness about OER can be cultivated.

Suggestions

The research results offer the following recommendations to decision-makers, implementers, and researchers involved in this topic:

- Providing specialized training on OER during seminar periods organized for teachers is crucial for enhancing OER awareness and utilization. Teachers knowing how to access these resources and use them can have positive contributions to their personal and professional development.
- MEB should establish central and local units dedicated to OER preparation. This can ensure that OER content is prepared according to specific criteria, leading to improved quality.
- Necessary arrangements should be made to facilitate intra-departmental and inter-departmental collaboration on OER in schools.
- Schools should create educational technology units led by education technologists, preferably information technologies (or, computer science) teachers. This will facilitate awareness-raising efforts regarding OER at the school level.
- MEB should establish a dedicated website for OER –like EBA and OBA– where only OER content is shared. Subject-specific resources should be provided on this website.
- Teachers accessing and contributing a certain number of digital teaching materials through the OER website on MEBBIS should be provided with both financial compensation and professional recognition. This will encourage teachers to develop their own materials instead of relying on ready-made resources.
- Additionally, teachers who contribute a considerable number of digital teaching materials through the OER website on MEBBIS should also be awarded service points. This will incentivize the production of digital teaching materials and lead to an increase in knowledge and the promotion of digital teaching materials.

- It is crucial to ensure that administrators, particularly school principals, possess knowledge about OER. Including OER-related questions in principalship exams can be a significant step towards guiding teachers to these resources.
- There is a noticeable difference in the number of OER initiatives between Turkiye and the rest of the world. Therefore, comprehensive OER preparation should be conducted by universities under the supervision of the Higher Education Council and by MEB for primary and secondary education. This will enable all stakeholders to access educational content more easily during future crises or when technology needs to be further integrated into educational systems.
- Elective courses related to the use and production of digital teaching materials should be prepared in all departments of undergraduate schools of education, and teacher candidates should be encouraged to take these courses. If possible, they should also be made compulsory. This will ensure that future teachers are aware of OER before starting their teaching careers.
- This research aimed to include teachers from as many specialty fields as possible. In future studies, branch-specific research can be conducted, and results can be presented. Furthermore, branch-based comparisons can also be made.
- The research attempted to reach teachers from all regions of Turkiye. Future studies can be conducted on a regional or provincial basis. This will enable comparisons between regions or provinces and facilitate decision-making for general or specific policies.

Authors' Note: This article reflects findings from master's thesis study of Soner Altintas, titled the Evaluation of the Habits of Usage of Open Educational Resources by Teachers Aiming at Their Personal and Vocational Development from the Angle of the Tendencies to Lifelong Learning.

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FOUR SCENARIOS OF PERSONALIZED LEARNING INTEGRATION MEDIATED BY A DIGITAL PLATFORM

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Received: 22/03/2023 **Accepted:** 31/08/2023

ABSTRACT

The process of humanization, placing a person at the heart of learning and teaching, has become a key movement in education to meet the requirements of the 21st century. In this regard, designing innovations to serve the human needs first is essential. Personalized learning (PL), being an example of a human-centric innovation, is a promising methodology that leads to positive student's outcomes. However, it has not found ts way in the practical implementation and has become a topic for heated debates among different stakeholders. This study investigates PL at the secondary education level underpinned by a digital platform. The PL integration is analyzed from the perspective of teacher practice (TP) which integrates the digital platform built on the PL methodology. In accordance with the thematic analysis of the interviews and the developed matrix of indicators for TP, PL has found its realization in four scenarios. In order to construct the scenarios, the study involves 24 semi-structured interviews with secondary school teachers. Prior to the interviewing, the participants were categorized in nine profiles due to the survey results of NorBa (traditional-constructivist beliefs) and technology readiness index (TRI). The results indicate that TP embraces four scenarios of the PL integration. The study outlines personalized learning as one of the scenarios, partial personalization (individualization and differentiation), non-personalized TP (traditionalism), and TP without digital platform embedding.

Keywords: Personalized learning, e-personalization, teaching practice, scenarios, digital platform.

INTRODUCTION

PL has become one of the promising trends in education, which is actively discussed by academic community and policy makers, integrated by school administrators and teachers, and appealing to students and their parents (UNESCO, 2022; The Book of Trends 2.0, 2015). Recent research on PL provides the evidence on its effectiveness (Pane et al., 2017, 2015), the support of students' satisfaction and intrinsic motivation (Alamri et al., 2020), triggering greater situational interest (Walkington & Bernacki, 2020), and fostering social and emotional skills (Author, 2021; Murphy et. al., 2016). Although PL "picks cherries" bringing together a range of ideas and theories, known about effective teaching (Jones & Mclean, 2018), its practical implementation is not seamless. In the USA, large-scale implementation of PL in high schools has been reported to be a challenging process, as tailored instruction and a variety of materials to every student

were found difficult for TP (Steiner et al., 2017). Courcier (2007) states that in England some teachers do not have a clear idea of personalization in learning, which might be connected with school leaders' decisions. In some schools of New Zealand teachers and leaders also do not have complete understanding of PL (Cardno, 2017). Swedish teachers (Bunting et al., 2021) relate PL with more work for them. In the Russian Federation, the initial steps towards personalization at secondary schools were found inconsistent and complicated for teachers, students, and parents (Kraynova & Obukhov, 2020). Recent studies show that the PL implementation varies both at an individual (teacher) level (DeMink-Carthew et al., 2017) and at an organizational (school) level (Steiner et al., 2020; Bingham et al., 2016). At an individual level, PL is related to teacher beliefs (conceptions, personal ideologies and values) and teacher predisposition to the integration, shaping the TP. Organizational level is the context for the methodology integration, including the organizational culture and climate, shared vision of the staff, necessary for PL scaling.

In response to the issue of the PL practical implementation, the focus of this paper is on school teachers' methodology integration, mediated by a digital platform. The research objective is to identify the scenarios of the PL integration and formulate the strategy for overcoming barriers and further scaling. The contribution is valuable for the research field as it distinguishes the levels of the PL integration mediated by a digital technology.

The article has five sections. The first part is a literature review of the perspectives on defining PL to outline the key elements of personalization, and its features in contrast to individualization and differentiation of learning to create the scheme for further analysis. In addition, the literature scrutiny refers to digital technology for PL in order to investigate similar to our study experience of digital tools embedding. The second section describes the research design, study sampling (the selection of schools and teachers), and the interview methods. The third part presents the findings, i.e. the four scenarios ranged by the degree of student-centeredness in TP, and the encountered barriers to the PL implementation. The discussion interprets the research findings, including teacher training implications for each scenario. Although the study was conducted in one country, the results might be relevant to other contexts, as PL was not integrated as a specific governmental reform.

PERSPECTIVES ON DEFINING PL

Personalization in learning has encountered various approaches in its definition, which leads to the ambiguity in conceptualization. It is one of the reasons why different strategies are adapted in practice. The educational organizations also do not express the same viewpoint on PL. The Organization for Economic Cooperation and Development (OECD, 2006) emphasizes taking into account students' strengths and weaknesses, while Pane et al. (2015, 2017) regard PL as learning tailored to address learner's needs and goals. From this perspective, PL is viewed as a customized approach to the teaching-learning process. However, the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2013) and Patrick et al. (2013) assume that tailoring instructions serve the purpose of student choice enabling student ownership. Therefore, the concept is interpreted by a student as an active agent of the learning-teaching process, taking ownership of one's learning. In addition to the international organizations' conceptualization, the researchers worldwide provide their interpretation of the methodology. Bray & McClaskey (2014), in Making Learning Possible, claim that students are active participants in PL, having a voice in what and how they learn and a choice to demonstrate what they know in a learner-centered environment. As Walkington & Bernacki (2020) point out, this viewpoint has become ''particularly influential in schools" (p. 238). In accordance with the provided opinions, personalization is viewed from at least two angles. The first is tailored instructions due to the individual characteristics and needs, and the second is student choice and voice in learning. From the perspective of this study, PL will primarily be viewed through learning which, being a constitutional element, provides a student with choice and voice in the education process (Author, 2022). Nonetheless, there are other concepts that are close to PL and student-centered perspective; hence, the boundaries between differentiation, individualization, and personalization should be outlined.

Differentiation, Individualization and Personalization of Learning

The three concepts in question lay in the continuum of teacher-centered learning (TCL) and student-centered learning (SCL). In accordance with O'Neill & McMahon (2005), TCL and SCL vary by the following parameters: (a) student choice in learning, (b) active versus passive learning and (c) power. The power in TCL is primarily given to the teacher, whereas in SCL, learners possess the power, and there is "student empowerment" in the learning process (Attard et al., 2010). The active parameter is connected with student choice in learning, since students have the power in SCL. Therefore, they are able to make a choice while in TCL, such opportunities are limited. Finally, TCL suggests that learners are passive, i.e. they are the recipients of knowledge, whereas SCL encourages student's active participation.

Regarding PL, different opinions are expressed on its position in the TCL-SCL paradigm. Cuban (2018) proposes viewing PL on the continuum, rather than staking out a single static point. At one end of this continuum are teacher-led classrooms, in which learning is tailored to the achievements of individual students to teach pre-determined content and skills; at the other end are student-centered classrooms that, with tailored approaches, aim to ''cultivate" student participation, expressing the student's own interests (Attard et al., 2010). However, Kaufman et al. (2020) propose that an ''ideal personalized learning system" is truly student-centered (p.16). The same viewpoint is expressed by UNESCO (2013), and Bray & McClaskey (2014). In regard to differentiation and individualization, the Book of Trends in Education 2.0 (2015) claims that the concepts are teacher-centered. Owing to the TCL-SCL parameters introduced by O'Neill & McMahon (2005), student choice is fully given in PL, being student-centered, while in individualization and differentiation, these opportunities are limited. As for the second parameter, PL gives power to students, enabling their choice and voice, whereas in individualization and differentiation, power is given to the teacher, who is a driver of learning. In the latter two, the individual characteristics are taken into account, yet it is the teacher who makes the decision on the goal to set, the content to cover, and skills to develop. The third parameter, ''active versus passive learning," varies in all three concepts caused by the method of instruction. In differentiation, the instructions are given for a group of students who share the same characteristics; in PL, the student chooses the learning method, and in individualization they are given for each individual student (the Book of Trends in Education 2.0, 2015). Yet the concepts are different not only in the methods of instructions and distribution of the power, but also in the curriculum objectives, responsibilities of learning and assessment. Thus, the matrix of characteristics is necessary for a clear understanding.

We attempt to build the scheme of concepts on the basis of the available research. For its development, the conceptualization of Bray & McClaskey (2018), the Book of Trends in Education 2.0 (2015) and the view of the Foundation ''Investment in the Future" (2020) were adapted. The main criterion for their selection was the information provided on all three concepts and their characteristics. The key features of differentiation, individualization and personalization are presented in Table 1.

Table 1. Characteristic features of personalization, individualization and differentiation in learning-teaching process.

	Differentiation	Individualization	Personalization
Centeredness	teacher-centered	teacher-centered	student-centered
Curriculum objectives	the same curriculum objectives for everyone	the same curriculum objectives for everyone, specified for individuals	each student has his/her own learning goals
Education boundaries	education is limited to school (as the place of study)	education is limited to school (as the place of study)	education does not end at school, it goes beyond the education system and hard skills
Responsibility for learning	the teacher is responsible for student learning	the teacher is responsible for student learning	the student owns learning and shares responsibility with the teacher
Instructions and tools	different instructions and tools for groups of learners	different instructions and tools for individuals	the student chooses the method, when and where to learn

Design of learning	the teacher organizes the learning-teaching process according to the group characteristics	the teacher organizes the learning-teaching process according to individual characteristics	the student actively participates in organizing the learning-teaching process according to his/her own learning trajectory
Collecting data about students' to inform learning	the teacher informs learning with data and students' progress to modify further learning for groups	the teacher informs learning with data and students' progress to modify further learning for individuals	learning is informed by data on students' needs, interests and progress, The data is constantly updated, to design learning pathways
Assessment	assessment *of* learning with some elements *for* learning	assessment *of* and *for* learning with some elements *as* learning	assessment *as* learning and *for* learning with minimum *of* learning

The table shows that differentiation, individualization, and personalization are respectively on the teacher-to-student line. Differentiation and individualization share the same *curriculum objectives* for learners, and in PL, each student has one's own goal in the learning process. Regarding the element *educational boundaries*, PL differs from the other concepts as it goes beyond the school, within and outside the classroom, and learning occurs at different times and places. It means that a student should have the possibility to gain knowledge and skills anytime and anywhere (Patrick et al., 2013). Besides, the concepts vary in *learning design*, in which tools, instruments, and instructions are distributed for groups, e.g., "strong" and "weak" students (differentiation), or are addressed at individual students (individualization). Regarding differentiation, Dumont and Ready (2023) argue that schools have a tendency to treat academic differences as obstacles and group students with similar abilities together; therefore, differentiation may result in reducing student heterogeneity. PL, being purely SCL, proposes a learner who chooses the tool and method to receive the content. In individualization and PL, for each student, the decisions of learning design, tools, and methods to use are *underpinned by data about students* that is regularly collected and analyzed. Pane et al. (2017) suggest developing personal profiles as a "record of each student's individual strengths, needs, motivations, progress, and goals" (p. 6). These profiles make individual learning plans possible. In *assessment*, PL places emphasis on formative assessment (*for* and *as* learning) with little amount of the summative assessment (*of* learning). Summative assessment is common for differentiation with limited opportunities for assessment *for* learning.

The most significant difference of PL from other concepts is the element of choice in the learning process. The choice is closely connected with *responsibility,* shared between the student and the teacher. From a PL angle, the education process should involve opportunities for freedom of choice, e.g. acquired knowledge and skills might be demonstrated in various forms: a project with peers, individual research or presentation so that a learner has a chance to make a decision. Edelson et al. (1999) state that when students make active learning choices, they are motivated to learn and to develop a sense of ownership. The choice and voice might be limited by a responsibility over one's own cognitive development. Students may not be ready to share this responsibility or they may not know how to make the right decision in learning to achieve their goals. Furthermore, Prain et al. (2012) argue that teachers may have doubts about students' abilities to make appropriate decisions in the educational process. Consequently, teacher might not be ready to provide a student with a choice; thus, the problem can be related to giving control to a learner over the education process. Willower et al. (1967) proposed Pupil Control Ideology, in which teachers and students adopt humanistic orientation and are willing to act on their own volition and accept responsibility for their actions.

Digital Technology for PL

Technological advances in the era of digitalization are viewed as a medium of making personalized learning possible. Abbott et al. (2014) support this viewpoint, stating that "technology is necessary to bring personalized learning to scale" (p. 14), as well as Abu-Rasheed et al. (2023) express the opinion that technology-enhanced learning has the potential to enable personalization. Contributing to digital technology implementation, Boninger et al. (2019) argue that digital platforms are vital for a shift from a one-size-fits-all method to more personalized instructions. In addition, OECD (2023) outlines that digital tools may cater to varying student needs, allowing personalization. Nowadays, there are several instances of digital platform embedding in education.

Summit Learning Public Schools (n.d.) adapt the personalized approach to teaching and learning in the K-12 context. The initiative encompasses more than 400 schools in the USA. The school-participants are provided with ongoing support, professional development of staff, teaching materials, and a digital platform that supports what teachers and students do in class. Secondly, learners are enabled to set goals, and teachers can monitor progress and provide students with individualized support via the platform (Summit Learning, n.d.). Besides, Lindsay Unified School District (LUSD) integrates a personalized learning model supported by the digital element ''Empower" and, like other platforms supporting PL, students can access the learning content anywhere and anytime and track their progress (Holland, 2020). With regard to students, Holland (2020) outlines that LUSD has invested in fostering a student agency and developing their students as online/blended learners.

Another instance of a digital platform in higher education is ''Knewton," which is also aimed at personalization. The project includes courses on biology, chemistry, economics, mathematics, psychology, and statistics. It is an adaptive digital tool that takes into account students' individual characteristics: pace of learning, gained knowledge, and a better way for the learner to internalize the content. The experience of Arizona State University with learning on Knewton has shown that the portion of students withdrawing from the courses fell from 13% to 6%, and pass rates rose from 66% to 75% (Upbin, 2012).

One of the examples of a well-developed PL digital platform is ''SberClass" (SC). By November 2020, SC was integrated into nearly 2500 schools (Investment in the future, n.d.), which is 6% of the total school number in Russia (*N=40346* at the beginning of the 2020-2021 academic year (Gokhberg et al., 2021)). The platform aims at teaching 3-11 grade students. SC allows learners to create personalized learning plans, set and achieve goals, promote soft skills (creativity, critical thinking, teamwork, and leadership), and covers the majority of school subjects (maths, geography, history, literature etc.). The platform of the PL methodology has been used by schools in 65 regions of the country (SberUniversity, n.d.). The company provides the fellow school with the access to the platform and the teacher training program to integrate PL. The students can use SC inside as well as outside the school, covering the already compiled modules or the tailored made ones by a teacher. Each educational module includes four levels: the first - motivational (tasks, aimed at covering the topic of the whole module), the second - basic (comprehension and application of the knowledge), the third - target (analysis and synthesis), the fourth is the level of approximate development (research, project-based learning, and the application of the material).

Despite the potential of digital tools, the viewpoint on their limitations is also expressed. Vermette et al. (2019), taking a human-centered perspective to understand instructor's software and the PL integration, found that teachers were hindered by technological barriers. The study of Robinson & Sebba (2010), examined the use of technology and revealed that technology continues to find gaps in the ways in which it is used for PL; Beresford (2017) is convinced that digital platforms for PL involve boundaries for scaling the methodology. Furthermore, teachers' positive perception of digital tool for PL may not align their TP of technology use to foster personalization (Schoors et al., 2023).

On the one hand, the availability of technologies gives greater opportunities to support PL; on the other hand, embedding PL requires educators to reflect deeply on their TP and leads to the shift in their pedagogical approach (Sasikumar, 2023). PL encounters the set of obstacles to integration in TP in different countries, e.g., the USA (Steiner et al., 2017), England (Courcier, 2007), Sweden (Bunting et al., 2021) and the Russian Federation (Kraynova & Obukhov, 2020). In this connection more research on PL mediated by a digital element is required. Our study, making a contribution to the field, aims at investigating TP and distinguishing the levels of the PL integration accompanied by a digital platform. We believe that finding the degrees of the PL implementation is essential for a successful methodology scaling.

METHODS

This study investigating teacher scenarios of the PL integration was a part of the large-scale research project ''Digital School Platform of a Personalized Model of Learning" in the Russian Federation (2020-2022). This article includes the data, obtained by [details removed for peer review]. The research design on teacher scenarios refers to a sequential contributions strategy (Morgan, 2014), which uses the quantitative data

and results in order to facilitate qualitative outcomes, particularly to develop the informant profiles in this study. The school sampling was predetermined by the agreement of the project parties, and the informants sampling for the interviews was a part of the authors' duty. The study involves 24 semi-structured interviews with school teachers. The interviews were conducted with the use of an interview guide with eleven blocks of questions prepared by the research team beforehand. The key blocks referred to teacher perception of PL, digital technology and the PL integration, barriers to the implementation, cooperation among colleagues, student voice and choice in the learning process. The average duration of the conversation was 47 minutes. The informants had access to the digital platform of a personalized model of learning, ''SberClass" and adapted the personalized learning methodology in their teaching. The sampling procedure followed two stages: (1) the selection of schools, (2) the selection of the informants. The research used a non-probability sampling method.

Participants

The Selection of Schools

Firstly, all schools, belonging to the four territorial entities of the Russian Federation (Voronezh, Kemerovo, Lipetsk, Tomsk), were surveyed. The 1344 educational establishments (66% of the general population) participated in the survey, including the schools which applied for the SC integration. Then, the applied educational establishments were matched with those, which did not send the application, by propensity score matching method. The matching was carried out due to the school characteristics, collected from the survey (the school infrastructure: the number of equipped IT rooms, the number of computers available for learning in-class and outside of classes; the total number of students and teachers; the percentage of teachers with a higher qualification category). Finally, the school-participants (*N=372*) were selected. Both rural (59.4%) and urban (40.6%) were involved in the study, and nearly a half (46.3%) had access to SC. Before the academic year, the schools in the experimental group received the training sessions of the platform integration, so had the experience of SC use. After the selection of schools, contacts with the teachers were established.

The Selection of Teachers

In accordance with the explanatory design (sequential contribution), the teachers, provided with SC, were firstly sent the questionnaire administered in the software ''SurveyGizmo." Due to the purposive sampling nature, the interviewees should have met the following parameters outlined in the survey:

1. The teachers of Mathematics and the Russian language who conducted classes for the 5th grade students (secondary school) on a regular basis.
2. The teachers who were integrating the platform for at least three weeks during the academic year.

Before its integration on the syllabus, teachers had training on the PL methodology and digital platform as part of the research project.

1. The teachers who responded to the two blocks of the questionnaire i.e., teacher beliefs and technology readiness as the prerequisite for the PL integration mediated by technology.

The teachers were expected to respond to the survey as their subjects and classes were selected to participate in the research but submitting the answers to the form was not obligatory.

The two blocks of the questionnaire referred to (a) Nordic-Baltic comparative research in mathematics education questionnaire (NorBa instrument developed by Lepik & Pipere (2011), adapted to the Russian language and assessed in terms of psychometrics by Kulikova (2019)), and (b) the items to determine the Technology Readiness Index (TRI methodology developed by Parasuraman & Colby (2015), adapted and checked in terms of reliability and validity by Khavenson and Gizatullin (2020)). NorBa investigates teacher beliefs on the teaching-learning process and involves two scales: ''traditionalism" and ''constructivism." In accordance with OECD (Vieluf et al., 2012), constructivism suggests a more student-centered approach to teaching. Thus, in this study, the teachers who adhere to the constructivist style were assumed to integrate the PL methodology more successfully in comparison to the instructors who demonstrated traditionalism.

Secondly, TRI determines a person's predisposition to use new technologies and consists of four dimensions: optimism, innovativeness, discomfort, and insecurity. The high index shows that a teacher is inclined to accept new technology, whereas low index reflects teacher resistance to it (Parasuraman & Colby, 2015). The study involves the informants with different indices of TRI and NorBa to investigate the implementation from different perspectives.

Based on the NorBa and TRI results, the respondents were distributed into five groups (quantiles) in sequence due to their indices. Regarding TRI, the teachers in the first quantile had the highest index of TRI, in the third - medium, and in the fifth - the lowest TRI. The same procedure was used for the scale ''constructivism" of the NorBa instrument. Hence, in accordance with variable crossings referred to quantiles of TRI and NorBa constructivism, the teacher profiles were developed (see Table 2). The profile index and socio-demographic characteristics of the informants are outlined in the Appendix (see Appendix). The contact with the informants from each profile was established via the regional manager.

Table 2. Teacher profiles for semi-structured interviews

Profile number	Technology readiness index	NorBa constructivism index
9	high	High
8	high	medium
7	high	Low
6	medium	High
5	medium	medium
4	medium	Low
3	low	High
2	low	medium
1	low	Low

Data Collection and Analysis

The research is a qualitative study, gathering data via semi-structured interviews. The aim was to investigate the context of the PL integration, mediated by digital technology, with teacher practice and the perception of the PL methodology. The interviews were conducted in March 2021 in online format. Each meeting was recorded following informant agreement.

The thematic analysis (Braun and Clarke, 2006) for qualitative data was applied in the study. The procedure of analysis involved the following stages:

1. Transcribing the interviews with the aid of the recordings.
2. Familiarity with the data.
3. Generating primary codes.

The data was analyzed with the ATLAS.ti, and more than 200 codes were generated. The Excel spreadsheet was also created with the data on TP with the digital platform and the PL integration.

4. Grouping codes into themes.
5. Reviewing the themes and included codes.
6. Reviewing and developing the map of themes with the quotes.
7. Interpreting the results.

In order to differentiate one scenario from another, the matrix of characteristics outlined in Table 1 was used. Yet, the majority of the interviews represent the practice in which the features of several concepts are displayed, e.g., personalization and individualization. In such cases the analysis involves a modified version of indicators:

1. Student-Centeredness of the Education Process

PL is truly student-centered, so a learner is an active participant of the process, having choice and voice. If it is only the teacher who makes a choice in what, how and when a student should learn, such cases are regarded as non-personalized and teacher-centered.

2. Design of Learning

Teacher-centered practices may refer to individualization, differentiation, and traditionalism. In order to define other non-personalized scenarios, the analysis seeks the practice in which the learner's interests, abilities and needs are taken into account, providing the opportunity to create an individualized learning trajectory. If a teacher-centered practice involves this indicator, it is regarded as either individualization or differentiation, because both concepts take the learner's interest, abilities, and needs into consideration. The difference is the focus of instructions, i.e., for each student or for groups of students.

3. Flexible Learning Environment

Since the PL is integrated by a digital element, the flexibility of learning is essential to take into account. Pane et al. (2015) relate flexibility for PL with the blending learning format. Hence, the criterion involves the opportunity to access the platform in and outside classes. Secondly, teacher instructions are based on a technology application. The digital platform should be regularly used by the students and a teacher (not fewer than three times a week), otherwise the teaching-learning process is not fully underpinned by technology. The authors view digital technology usage during nearly each lesson as an effective way of the PL integration. The flexibility is also ensured by the variation of interaction patterns (whole class teaching is teacher-centered; individual, pair and group work are more student-centered practices). Pane et al. (2015) argue that the student grouping distinguishes the success cases from others.

The scenarios are built due to the elements in Table 1. The cases, representing two or more concepts, are assessed against the three aforementioned indicators in the given order.

FINDINGS

In accordance with the characteristics of personalization, individualization, and differentiation, and a modified version of indicators, four PL scenarios are distinguished in the study. The cases refer to the four degrees i.e., full, partial, non-personalized and the absence of technology and methodology implementation (Fig. 1).

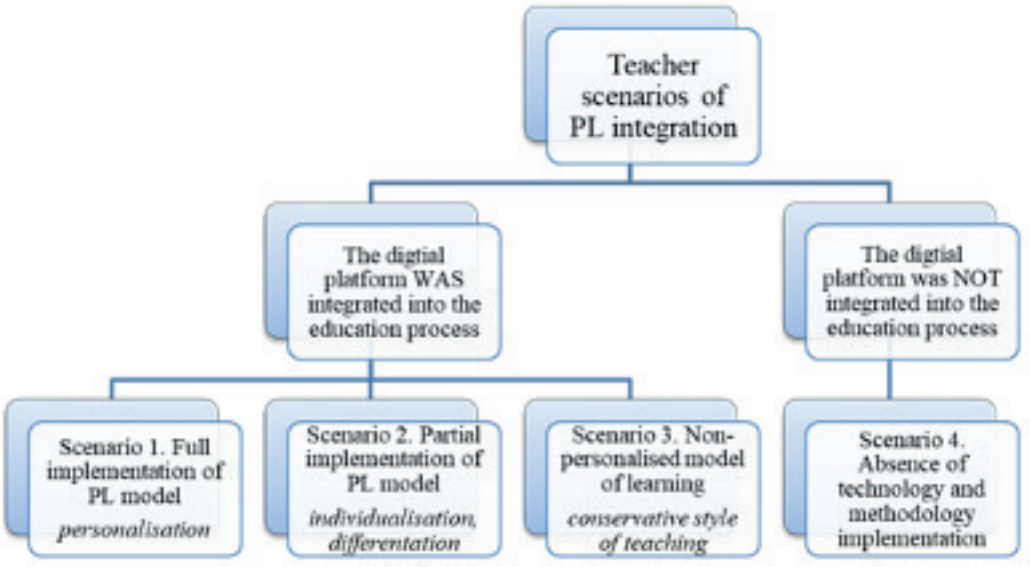

Figure 1. Teacher Scenarios of the PL Integration

In the first scenario *"Full implementation of the PL model,"* a learner is regarded as an active participant of the education process that could take into account individual characteristics, abilities, needs, and interests. The learning trajectory is built by both a teacher and a student. The teacher creates a flexible learning environment by the regular use of a digital platform and the adaptation of classroom space and different interaction patterns. The scenario reflects a personalized student-centered approach. The TP in the second scenario, *"Partial implementation of the PL model,"* views a learner as an object of instructions in which individual characteristics are also considered. However, the learning trajectory is usually built by a teacher. The TP sometimes involves the variation of interaction patterns. The adaptation of classroom space to the methodology rarely occurs and a digital platform is used occasionally. The scenario encompasses the features of individualization and differentiation, with a few elements of PL and refers to a teacher-centered approach. A *"Non-personalized"* scenario regards a learner as an object of instructions in which individual characteristics are rarely considered. Therefore, a personalized learning plan (PLP) is not created. The TP frequently uses the whole class and individual work patterns, and the adaptation of classroom space to the methodology does not take place. A teacher and learners use the platform as an additional content storage (e.g., hometask material, tasks for checking comprehension and assessment) without the personalized approach. The platform is sometimes hindered by the obstacles to its integration. The scenario reflects the conservative style of teaching. In the distinguished scenarios, the digital platform is integrated with different degrees of student centeredness. Yet, the results have indicated that some of the informants did not use the platform in TP or integrated the PL methodology. Such cases comprise the fourth scenario, *"Absence of technology and methodology implementation,"* in which the teacher encountered the various barriers to the implementation.

Scenario ''Full Implementation of the PL Model''

The scenario involves cases in which teachers have integrated the PL methodology, adapted the style of teaching and used the platform. The informants conduct classes in mathematics in urban schools and have high indices of both TRI and constructivism in teaching (NorBa instrument); hence, refer to profile nine. One of the teachers has experience of integrating SC in the previous school year. The distinctive feature of this scenario is a learner as an active participant who makes a decision in the education process. The informants answered the interview questions using the active voice to describe students' actions: "*children identify their specific goals to achieve*" (T4), *"they [students] choose the level of difficulty on their own*" (T7).

In the first scenario, the education process involves building a learning trajectory for each student, starting with setting individual goals first. The PLP is established by a student with the help of a teacher. Due to PLP "*learners acquire new knowledge at their own pace*" (T4) and are able to track their progress regularly. If the knowledge gap is identified, they may refer to the learning material one more time to fulfil it. One of the respondents reported that she does not set strict deadlines to cover the content on the platform, and the reason is: "*we give the chance [to a student] to return to the content*" (T4). This also allows students to be flexible throughout the education process.

The cases represent the flexibility of the learning environment. Firstly, it is the availability of digital content for students that makes learning happen at any time and at any place:

> *Children may access the platform at home, children may spend extra time in the class, equipped with laptops for each student to take the tasks. If learners have not managed to fulfil [the tasks] on the platform in class, they can do it after.* (T4)

The instance shows the learning outside the class underpins PL. The classroom space, being part of the learning environment, is usually adapted to various interaction patterns. The special zones are created for group and individual work, including a digital component. Due to the teacher responses, the platform aids the TP, creating additional conditions for learning and expanding the boundaries for PL.

In this scenario, TP values collaborative learning as an element of PL (OECD, 2006). The classmates are viewed as another source for acquiring knowledge: "*Children who go ahead can take the role of a consultant <...> they can help other students who struggle with the content*," (T4). The cases involve peer-teaching, developing student autonomy in which learners cooperate, teach each other, and actively participate. We assume that PL leads to the development of autonomous learning as it implies conscious decision-making and responsibility

from a student side. The informants report that they discuss the platform integration with colleagues to prevent learners from being overloaded.

Regarding teacher perception on the PL methodology, the informants express a positive attitude. The platform coincides with a student-centered style of teaching in grading tasks, in accordance with the student's abilities. The informants expressed the belief that PL, mediated by technology, is a necessity, because "*today children are another generation*" (T7) and they need new approaches for learning. Despite the regular use of SC, the informants recognize the platform integration being not equal to the methodology integrating: "*children work on the platform for 20 minutes, then for the rest of the lesson, they learn in groups, individually or with a teacher*" (T4). Although using any digital source during the lesson for more than 20 minutes is restricted by state sanitary regulations and standards, teachers also understand that the platform is an instrument to put PL into practice.

This scenario refers to TP in which students are active participants of the process with their own PLP and goals to achieve. The cases have favorable conditions for the PL implementation, i.e., technological equipment, classrooms with specific zones for learning, and cooperation with colleagues that leads to joint decisions.

Scenario ''Partial Implementation of the PL Model"

The cases demonstrate teaching that has the elements of personalization as well as individualization and differentiation. The partial implementation of the PL model has become the most frequent scenario in the study.

The teacher profile includes different indices of TRI and NorBa, and the majority of the informants have medium or high indicators (profiles 4, 5, 6, 8, and 9). The scenario involves different subject areas with the prevailing urban school type. Students are viewed as active participants who can "*choose the individual activities*" (T12) and differentiate the level of a task's difficulty. Some informants provide students with a choice in the education process. However, the scenario usually implies a teacher-centered approach to the methodology integration, i.e. an instructor makes a decision on learning content for home and class work: "*I give the tasks from the coursebook and the additional from the platform*" (T5). The choice of activities is usually restricted by the teacher, who chooses what to provide the learner with.

The informants report that they build the learning trajectories. However, these pathways are created for not only individuals but also for groups of students. The key feature of the scenario is differentiating learners into two groups by their abilities: ''weak" and ''strong," ''high-level" and ''low-level." The platform coincides with TP, as it involves the activities graded by difficulty, so the instructors' select tasks for the two groups of learners: "*I frequently use it [SberClass] with high-level students, because I need them to be busy while I am trying to cover the education program with the low-levels*" (T22). The informants use the content on the platform to adjust the education process to students' levels, making one part of the class busy to work with other students. The methodology of PL is partially put into practice, implying teaching groups rather than individuals.

In this scenario, the learning environment is flexible to a certain extent. The informants view the opportunity to learn outside the class with the platform as an advantage: "*the platform can always be used by a child at a suitable time, it is not always at the lesson, it might be another time period when one has free time to spend on studying*" (T8). It helps students to master the material when a coursebook lacks information on the topic. The cases represent the use of different interaction patterns, such as individual, pair, and group work. One of the teachers states: *"The advantage I have noticed is that there is individual work as well as group work*" (T12). Most teachers value the variation of interaction patterns, making TP more student-centered with the platform. In contrast to the previous scenario, the informants of partial implementation do not frequently report about the flexibility of the learning-teaching process due to the availability of a computer room in school, which might be occupied by another teacher and a low Internet connection.

Similar to the previous scenario, these cases take advantage of the opportunity for peer-learning and -teaching at the SC implementation, the instance is project-work. The instructors are convinced that project-based learning is a practical way of PL realization in TP. However, the pattern of staff collaboration for methodology and platform integration was not identified.

Concerning the teachers' viewpoint on PL, the expressed opinions are not homogeneous. We found two contradictory beliefs in this scenario: the PL methodology fits mass school learning and PL does not fit all students. Regarding the latter, the informants value personalization and state that it has great potential for education: "*the personality of each student is developing*" (T6). These teachers are ready to continue the PL integration. The former belief is that PL is for particular groups: "*The trouble is that personalized learning is not for all <...> I would suggest integrating it into strong classes*" (T8). Although teachers understand the methodology, they see its limitations for low- and medium-level students who do not even complete the tasks. The proponents of this belief seem to stop the PL implementation if possible. Most instructors agree that the digital component is helpful with such benefits as the range of activities and their appropriateness for different learners, its fitting to an individual's pace, and stimulating search skills and student satisfaction. Yet, the informants constantly mention the irregular use of the platform: "*every lesson - no, we do not have this*" (T3), "*one or two times a week*" (T8). The distinctive characteristic of this scenario is using the platform as an additional storage of activities. The teachers select particular tasks relevant for a particular topic and give homework.

In ''Partial implementation of the PL model" TP encounters the obstacles to digital component implementation:

Parents' viewpoint on the platform for learning: The parents complained about too much time spent by the children in front of a computer at home. Secondly, they usually help fifth grade learners with hometasks, which implies their own understanding of SC.

Internet connection: The informants usually report unstable Internet connection which restricts the platform use at school. There were those who devised a strategy to overcome the problem: "*for this reason, we print the materials*" (T2).

Complexity: The interviews revealed that the learners have difficulties with studying on the platform: "*many children had serious troubles*" (T3). The possible reasons are related to the insufficient user experience and technical problems.

The second scenario is mostly shared by the instructors of a teacher-centered approach. They adjust the materials and tasks to individuals or groups of students, building the learning trajectories; however, the decision is usually made by an instructor. The learning environment is flexible, but the obstacles to the platform integration are found, i.e., its episodic use, parents' concerns, technical issues, and the complexity for students' use.

Scenario ''Non-personalized Model of Learning"

The practice, referred to as the non-personalized model of learning, follows a conservative style of teaching in which the instructor is at the center. The cases rarely demonstrate the individualization or differentiation of the learning process. We found that these informants integrate the platform with few or no changes to TP towards personalization. The majority faced the obstacles of digital and the PL implementation.

The cases involve different indices of TRI and NorBa, whereas the two informants have high indicators (profile 9). The scenario represents different subject areas and different geotypes of school. Most teachers have considerable work experience. Presumably, they have formed, through years, the style of teaching that is difficult to change. Also, the instructors face the obstacles to SC use, leading to a lack of the PL integration.

The informants frequently view PL only through the platform use. Since the digital component was implemented insufficiently, the learning environment was not flexible. Similar to the second scenario, TP, enhanced with the aid of SC, represents a more traditional way:

To assess the students' knowledge: The time-efficiency of the digital element is valued, e.g., to administer tests which are automatically checked. According to the instructors, it saves their time outside of classes and for other in-class activities.

To consolidate previously introduced material and check the students' comprehension: The exercises on the platform, which are of differing difficulty, usually appeal to the teachers. Although most respondents consider SC as an additional source, they do not view it as an instrument for PL. The informants, similar

to the second scenario, use SC as the storage of interactive exercises and tasks. We also found that these cases demonstrated a limited integration of the platform. The instances indicate that the PL methodology, mediated by the platform, is not implemented, and there are several reasons for this:

Internet connection: It was emphasized that low Internet connection at school became one of the most frequent barriers to the platform integration. This restriction prevents full and partial technology and methodology implementation. Some informants agreed that they would use the platform if the connection were stable. To overcome this gap, one of the informants reports about the strategy: "*Every student has a modern cell phone, so we work on SberClass*" (T15). However, this way-out has the limitations imposed by the government on the telephone use in class.

Availability of technical equipment: The informants report that they cannot use the platform in class, as there is no connection, or an available room with the computers. This circumstance is typical of rural schools with one IT-classroom.

Teachers struggling to master the platform: A lack of knowledge and skills to master the platform is another common barrier. Nearly half of the informants state that they needed more time to investigate the technology: "*We use it not that actively as we would like to, because, I will repeat, we were short of time to figure it out fully*" (T20), which resulted in practical misuse, for instance: "*children of ours little fulfil [use the platform], as we have not learnt it from cover to cover*" (T11). Although some teachers are ready to implement PL supported by the platform and introduce adjustments to TP, they do not understand how to use this instrument and with whom to discuss the problem.

Preparation for qualifying state exams: The problem refers to the requirements introduced by the government. One of the informants states that the platform differs from the state educational program: "*this platform, one way or another, is different from what a student has to acquire [to pass the exam].*" This teacher also feels vulnerable when they speak about end-of-year state exams: "*we are approaching Final Qualifying Exams and [teachers] start being nervous*" (T21). The instructor prioritizes the successful exam completion by students and feels responsible for it, because it may be related to school ratings.

In the non-personalized scenario, the teachers are inclined to integrate the platform as an additional source with rare usage. The cases indicate the episodic technology integration, preventing the educational process from personalization with the platform. Most of the barriers from the second scenario are repeated in the third. It was found that the informants require more time to master the platform as a distinctive feature of this scenario.

Scenario ''Absence of the Technology and Methodology Implementation''

The last scenario refers to the cases in which a digital platform and methodology were not implemented into TP. The teachers did not integrate SC, or apply the personalized learning methodology into their TP.

Most teachers conduct classes in the Russian language and work in rural schools. The indices of TRI and NorBa in the two cases were not managed to identify due to insufficient data provided by the informants. The reasons preventing TP from using the digital component are:

Time constraints: The most frequent reason is the lack of time to master the platform. The instructors report that they are overloaded with classes, and some informants concurrently hold two positions at school, for instance teaching and administrating. In order to master the platform, additional time is required in this scenario.

Internet connection: Similar to the second and third scenarios, unstable Internet connection is an obstacle to using the platform: "*Connection, technical failures - we also have bad connection at school*" (T13). One of the informants argued that the problem was relevant to students: "*We have two persons in our group, who have access to SberClass, two persons only*" (T17). The accessibility of the platform depends on the school's Internet connection and the students' home Internet connection and hardware.

Teacher struggling to master the platform: Despite the guidelines, some of the teachers have difficulties comprehending a new technology, as there are "*many ambiguities*" (T17).

We have found that these teachers do not reject the idea to implement PL in the future: "*I tried, I investigated.*

It is difficult for me, but I am going to, I am planning" (T13). It might be connected with the requirements imposed by the administration or with the natural desire to master a new tool. Furthermore, nearly a half of the informants feel confident about the SC integration: "*I do not know anything about SberClass yet, but I know, I will learn [how to use it]*" (T9).

This scenario does not involve the five informants (Teachers 16, 18, 19, 23, and 24), who did not integrate the platform. The information provided from these teachers was not enough to outline the barriers to the SC usage or other patterns.

The scenario ''Absence of technology and methodology implementation" shows the TP without integration of the digital platform with a personalized methodology due to the lack of time and skills, and issues with Internet connection. Despite the obstacles, the informants express the viewpoint on successful the SC implementation in the future and its value for TP.

DISCUSSIONS AND CONCLUSION

This study is aimed at investigating the PL implementation, mediated by digital technology and by school teachers. Now that we have distinguished the teacher scenarios of how PL with the aid of the platform is introduced, we have a clear vision of what teachers display and lack in their TP. This gives a better chance of introducing PL in a more organized way.

Introducing PL to the education process results in various scenarios of TP. Therefore, adopting a single standardized approach to PL is not academically viable. This finding agrees with the previous studies showing that teachers at an individual level, (DeMink-Carthew et al., 2017) as well as schools at the organizational level (Steiner et al., 2020; Pane et al., 2015; Bingham et al. 2016; Robinson & Sebba, 2010) implement PL differently. The qualitative inquiry reveals one successful scenario, which is further viewed as illustrative for the PL integration, whereas the other three scenarios partially or do not correspond to the PL methodology. In these cases, the PL integration encounters the obstacles and may require considerable changes to TP and organizational support.

In the study, student choice was introduced in one scenario that is regarded as success. The teachers view a student as an active participant, sharing the control and responsibility in learning. Echoing Steiner et al. (2020), offering student choice is also uncommon for teaching in this study. Some informants from the other three scenarios report that fifth grade students are not ready to make a rational decision in learning due to the age-group peculiarities. We are convinced that this teacher's behavior is related to a more conservative belief about teaching. For successful methodology integration, conservative TP requires specific actions towards reinforcing a more constructive TP. Dealing with teacher beliefs, the process of change may take considerable time. Student choice, as a core PL element, should be promoted through special training, observations of other TP, and organizational support including horizontal links, e.g. tutoring system.

We also found that shared vision of staff on PL is essential for full personalization in TP. The cases with successful PL integration outline the common staff strategies, and the coherence in implementation informed by organizational culture and regular discussions. In agreement with Kraynova & Obukhov (2020), our research identified that undeveloped horizontal links lead to the lack of alignment within the staff and unsolved barriers to the PL and digital integration. We believe that ensuring organizational support and a sense of community is vital to overcome the difficulties that an individual teacher encounter.

Technical issues, including unstable Internet connection, is another common barrier that occurred in all scenarios that did not achieve PL. Since PL was accompanied by the platform, the teachers were supposed to implement the methodology via the technology, and this challenge impeded PL. Technical obstacles are commonly related to organizational level: school infrastructure and technology availability, but the degrees to which the challenge was experienced varied. This finding echoes the study of Bingham et al. (2016). As the platform is based on personalized methodology, the teachers in our research did not have the obstacles, described in other studies i.e., finding or developing their own resources (Pane et al., 2017; Robinson & Sebba, 2010), using the range of tools to introduce PL with technology (Vermette et al., 2019). Most informants used the technology for more complex tasks (higher-order thinking skills), especially during class time. We found that this finding does not support Pane et al. (2015) who state that technology for PL was

frequently used for routine tasks. We assume that the platform, saving teacher's time for preparation, gives the opportunity for more hands-on and cognitively challenging activities. However, the study reveals that integrating a complex technological tool may lead to misunderstanding and complaints from parents who help fifth grade students with homework. Some teachers in partial PL implementation and non-personalized model of learning were more likely to use the platform as an additional storage of materials not changing the TP. Integrating the platform for routine tasks in our study reveals TP without personalization, which might be a subject for further research.

Apart from technical issues, PL might be hindered by curriculum requirements imposed by the government, which was previously reported both in home country by Kraynova & Obukhov (2020) and foreign countries, e.g., Pane et al. (2015). Echoing the findings of Pane et al. (2017), this tension puts limits on how long students can work through the material, impeding the individual learning pace.

As described in the study by Courcier (2007), teachers have different understanding of the PL methodology. The perception of PL depends on the particular scenario: in the first scenario, most informants express a clear vision of PL and report the relevant practice, whereas the second scenario in ''Partial implementation" involve less student-centered focus, and in ''Non-personalized model of learning" most, or even all informants misunderstand the methodology. The TP without a clear idea of PL has no significant effect on methodology and digital integration.

The qualitative analysis uncovered that the barriers are consolidating from the previous cases, and, secondly, new challenges are introduced in the further scenarios. The challenges outlined in the second scenario are repeated in the third, and the barrier to PL mentioned in the third case are encountered in the fourth scenario, so they are gradually fossilized.

Our study confirms that the PL implementation with technology is not seamless, agreeing with Robinson and Sebba's (2010) research. Despite prior teacher training on the integration, teacher preparation practices and support do not usually catch up with the needs of the PL integration (scenarios 2, 3, and 4). This finding aligns with the study conducted by Bingham et al. (2016). We relate this pattern to external factors, such as school infrastructure, availability of technology, and schedule constraints, and to internal factors, i.e., a person's predisposition to use technology and teacher belief on the teaching-learning process, which might take time to change. We believe that the system of measurements is necessary to make PL, mediated by technology, work.

Teacher Training Implications

For the teachers of the ''Absence of technology and methodology implementation" scenario, the analysis of individual and organizational characteristics before the implementation is essential, providing targeted support to overcome technical issues and devising easy-to-use schemes of technology integration. These teachers can also be underpinned by the tutoring system among colleagues who have successful PL practice. Some teachers do not understand the PL methodology and require extra training and explanations on PL.

For the teachers of the ''Non-personalized model of learning" scenario, organizing extra training will be valuable, as some do not have a clear idea of PL in practice. We found that some informants do not feel confident about the platform integration, thus observing the colleagues' lessons will help to promote confidence in technology use.

For the teachers of the ''Partial implementation" scenario, showing the practical realization of PL is necessary, as their viewpoint on teaching already agrees with a more student-centered approach. The observations, recorded lessons, and workshops on methodology and technology integration are beneficial measurements for scaling TP.

The teachers of the ''Full implementation" scenario are illustrative examples of integration. Their TP might be regarded as the source for the TP development in other scenarios: conducting lessons for observations and workshops, and organizing a tutoring system.

Study Limitations

This study has several limitations, so the findings should be interpreted cautiously. Firstly, the results are limited by their self-report nature of TP. The actual teacher actions may not coincide with the reported ones during the interview. Secondly, the interview was initially aimed at identifying the context of the PL integration with technology, possible barriers to implementation, teacher's beliefs towards the methodology and impressions on the platform without explicit objective to outline the diversity of PL scenarios. Due to COVID-19, the interviewing was postponed for several weeks. Therefore, the informants had more time for the platform and methodology integration. The questions addressed initial steps to the PL and platform integration revealed the common practice and gave sufficient data to formulate the scenarios of the PL integration. The last limitation is uneven platform integration among teachers. The management system to monitor the activity at the platform revealed that the teachers started using the digital platform at different times of a school year. It means that they were at different stages of the PL platform integration, which is connected with the increased workload at the beginning of a school year and COVID-19 adjustments.

In conclusion, this study makes a contribution to the explanation of the PL implementation into the teaching-learning process at a school level. The research identifies four scenarios of TP towards PL mediated by a digital platform. The cases of successful PL integration refer to a student-centered approach and represent favorable conditions for methodology implementation, including a clear perception of PL, developed school infrastructure, availability of technology, fostered organizational culture with shared vision on PL, and cooperation among staff. The other three scenarios present a teacher-centered approach, in which the PL integration is hindered by individual characteristics (conservative beliefs and methodology misunderstanding) and organizational factors (technical challenges at school, lack of institutional support and undeveloped horizontal links). We found that the identified barriers are consolidating from the previous scenarios and new challenges are encountered in the further cases. In these scenarios, the PL implementation with a digital component requires significant adjustments to teaching and promoting organizational culture for further methodology scaling.

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APPENDIX

Profile Index and Socio-demographic Characteristics of the Informants

Informant number	Subject	Geo type	Year of birth	Work experience	Profile
Teacher 1	Mathematics	rural	1961	36	9
Teacher 2	Russian	urban	1978	20	6
Teacher 3	Russian	urban	1975	22	9
Teacher 4	Mathematics	urban	1986	12	9
Teacher 5	Russian	urban	1972	26	8
Teacher 6	Russian	urban	1977	24	4
Teacher 7	Mathematics	urban	1972	26	9
Teacher 8	Mathematics	urban	1988	6	8
Teacher 9	Russian	urban	1957	44	6
Teacher 10	Russian	urban	1983	5	9
Teacher 11	Russian	urban	1958	37	3
Teacher 12	Mathematics	rural	1988	10	6
Teacher 13	Russian	rural	1971	29	N/A
Teacher 14	Russian	rural	1980	12	1
Teacher 15	Mathematics	rural	1958	36	7
Teacher 16	Russian	rural	N/A	31	N/A
Teacher 17	Mathematics	rural	1990	8	N/A
Teacher 18	Mathematics	urban	1987	11	N/A
Teacher 19	Russian	rural	1966	35	9
Teacher 20	Mathematics	urban	1984	11	9
Teacher 21	Russian	rural	1972	27	2
Teacher 22	Russian	urban	1974	5	5
Teacher 23	Russian	rural	1973	27	5
Teacher 24	Mathematics	urban	1961	35	2

SOCIAL ANXIETY IN ONLINE INSTRUCTIONAL DISCUSSION FORUMS: THE ROLE OF PARTICIPATION STYLES AND ICT INFRASTRUCTURE

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Received: 26/03/2022 **Accepted:** 01/08/2022

ABSTRACT

Examination of the personal characteristics (i.e., gender, participation styles) of participants and the technical infrastructure (i.e., device type, internet connection type) of Instructional Discussion Forums (IDFs) can provide functional clues for mitigating social anxiety in these settings. In this context, this research investigated variances in learners' participation styles and social anxiety in IDFs in terms of gender and ICT availability. In addition, it explored the predictive relationships between participation styles and social anxiety. A sample of 272 freshman undergraduate students discussed various topics related to Internet ethics for three weeks through an IDF. The results indicated that participation styles differed by gender and ICT availability in several respects. First, handheld devices and cellular internet connections exerted a medium-size effect on social anxiety. Further, "to get information" and "to fulfill requirement" purposes in the "Why" dimension of participation styles had a small predictive relationship with social anxiety, as did "analytical" and "practical" participation approaches in the "How" dimension. Of these, only the "to get information" purpose negatively predicted social anxiety. Overall, participation styles accounted for 19.1% of the variance in social anxiety. Based on the findings, future directions and practical implications are suggested for both researchers and practitioners.

Keywords: Asynchronous online discussions, social anxiety, participation styles, gender, device type, internet connection type.

INTRODUCTION

E-learning is defined as "the use of computer network technology, primarily over or through the internet, to deliver information and instructions to individuals" (Wang et al., 2010, p. 167). One of the fundamental learning experiences undergone by students in e-learning settings is discussion-based interactions (Tibi, 2016). These are mostly carried out in Instructional Discussion Forums (IDFs), which are questioning

environments specially structured to support the collaborative learning process (Wu, 2021). In IDFs, different perspectives are reflected on a special topic, facilitating the co-construction of common knowledge through asynchronous social interactions. As a basic type of such interactions, asynchronous instructional discussion involves sending messages and emojis to an online environment that supports communication and collaboration to facilitate the learning process (Lima et al., 2019; Onyema et al., 2019) and enhance the perception of social presence among learners (Dahlstrom-Hakki et al., 2020). According to many scholars, discussion interactions positively affect the learning process through dimensions such as knowledge construction (Ouyang & Chang, 2019), academic achievement (Galikyan & Admiraal, 2019), collaboration (Chan & Chan, 2011; Shan & Wang, 2021), creativity (Corfman & Beck, 2019), argumentation ability (Bucheli, 2021), self (Vonderwell et al., 2007) and peer assessment (Ertmer et al., 2010), and motivation (Kang & Zhang, 2020). However, not all learners benefit from these interaction opportunities to a similar extent. Certain demographic characteristics such as gender (Guiller & Durndell, 2007; Lin et al., 2019; Zhou, 2016) and psycho-educational characteristics such as social anxiety (Muilenburg & Berge, 2005; Yen et al., 2012) result in differences in learners' discussion interactions. While the cognitive aspects of learning in discussion environments have been extensively studied, an understanding of learners' affective characteristics remains at a theoretical level; the practical implications have not been considered. Further investigation of this topic is required to guide the development of well-designed interactions.

Social Anxiety in IDFs

In e-learning, IDFs, chats, and virtual classrooms are environments where learners socially coexist and interact. One of the important constructs affecting social interactions in these environments is social anxiety (Keskin, 2023; Leary, 1983). Social anxiety is a salient emotional state that adversely influences the social relations of an individual within a particular social context (Heimberg et al., 1999). Individuals with social anxiety are afraid of being rejected or criticized by others in their social circle. Research indicates that socially anxious individuals avoid interaction, performance, and behaviors (Leary, 1983) and exhibit lower self-confidence and a tendency to avoid risk (Purdon et al., 2001).

According to social role theory (Bem, 1981) and gender schema theory (Eagly et al., 2000), social anxiety is experienced differently according to gender. Corroborating these theories, a review of literature by Asher et al. (2017) revealed that social anxiety was observed more frequently in females. By contrast, Zhou (2016) found that social anxiety has a more determining effect on the interaction behaviors of male students. The impact of gender on social anxiety may also differ according to the medium in which social interaction takes place. For example, Pierce (2009) showed that females experienced less social anxiety in online communication than in a face-to-face equivalent. Moreover, females felt less social anxiety in online communication than males, although the opposite is the case for the face-to-face medium.

Technologies used in asynchronous discussion environments such as device type might also lead to decisive differences in interaction patterns as well as learning performance (Lan et al., 2012). In this respect, it is important to determine whether the ICT infrastructure influences socio-affective outputs such as social anxiety. Although there is a consensus among scholars that handheld devices enhance commitment to the discussions or increase student participation due to their ubiquitous nature (Mac Callum & Kinshuk, 2008), there is a paucity of practical understanding concerning how these devices affect discussion interactions and dynamics.

Social anxiety significantly hinders the educational benefits of discussions (Sonmez, 2021). However, due to the widespread belief that students can generally cope with this, social anxiety is not adequately addressed in educational contexts (Topham et al., 2016). Therefore, although experienced less slightly in online environments (Pierce, 2009; Shalom et al., 2015), examination of social anxiety in terms of ICT infrastructure, participation behaviors, and student characteristics through academic discussions is likely to pave the way for new insights and perspectives.

Participation Styles in IDFs

Although asynchronous online discussions stimulate thinking processes and contribute to learning enhancement, ensuring students participate in these activities remains a key challenge for educators (Gaul & Kim, 2020). These have driven researchers to interrogate the dynamics of the discussions, including participation or interaction patterns, to enhance the existing body of knowledge. The participation styles of learners in online discussions are generally examined in the context of participation performance (e.g., Chiu et al., 2010; Naranjo et al., 2012; Ruthotto et al., 2020). Such performance is determined using page views, the number of messages, interaction time, and interpersonal interaction metrics. In most of these studies, participation is classified as active/passive, interpersonal communication-oriented/subject-oriented, or questioning/answering. Although the participation of students in asynchronous discussions has been handled in the literature in terms of class size (Afify, 2019), teacher and student roles (Ouyang & Chang, 2019) or facilitator/moderator types (Ghadirian et al., 2019), discussion environments/tools (Sun & Gao, 2017), instructional techniques (Ding et al., 2018) and participation patterns have not been adequately addressed. This impels us to reveal new insights that extend beyond how many comments students make in order to unravel the factors underlying participation behaviors. The determination of participation styles might also provide important feedback to practitioners that will enable them to support discussions in a more adaptive manner for students. In a study on the relationship between social interaction patterns and cognitive engagement in asynchronous discussions, socially active students were found to be more involved in knowledge inquiry and construction (Ouyang & Chang, 2019). Also, students engaging in in-depth inquiry were reported to participate more often in peer interaction and this was reflected positively in the co-construction of knowledge.

While students' participation styles have an impact on engagement in online academic discussions (Ghadirian et al., 2018; Ouyang & Chang, 2019), the styles are also likely to be affected by multiple other factors. For instance, device type might be expected to make a difference in terms of the possible effect of screen size on user-device interaction. Another issue is cellular internet data usage due to the shorter interaction time deriving from high procurement costs. In addition, the ubiquitous availability of mobile phones might change the way participants behave in IDFs (Lan et al., 2012).

Regarding gender, because Turkiye is a patriarchal society (World Economic Forum, 2020), gender roles may possibly influence interaction performance, even in e-learning environments (as per social role theory and gender schema theory) (Bem, 1981; Eagly et al., 2000). In this regard, several studies have identified differences according to gender in terms of participation behaviors and the length and number of messages written in discussion environments (Diep et al., 2016; Prinsen et al., 2007).

The Predictive Relationship between Participation Styles and Social Anxiety in IDFs

Social anxiety is influenced by the environment in which the individual communicates (Yen et al., 2012), types of communication (Cuming & Rapee, 2010), perceptions (Barnett et al., 2021), and behaviors (Pailing & Reniers, 2018). Moreover, Bolsoni-Silva and Loureiro (2014) revealed that students' social skills, which might include participation styles, have a decisive impact on social anxiety. In this regard, identifying the source of social anxiety will significantly guide practitioners and researchers in creating environments that engender less anxiety.

Research Questions

This study examined the participation styles and social anxiety of learners in an IDF in terms of gender, device type (e.g., PC, handheld device), and internet connection type (e.g., fixed connection, cellular connection). The predictive relationship between participation styles, which represent user behaviors, and social anxiety, which is an emotional state, was also examined to obtain a more holistic viewpoint. For that purpose, the following research questions were formulated and addressed:

1. Does participation style for online instructional discussion forums significantly differ by
    a. gender,
    b. internet connection type, and
    c. device used?
2. Does social anxiety in online instructional discussion forums significantly differ by
    a. gender,
    b. internet connection type, and
    c. device used?
3. To what extent do participation styles predict social anxiety in online instructional discussion forums?

METHOD

This research was inherently grounded in a correlational research design. In correlational research, the aim is to unearth the relationship between the variables in question (Fraenkel et al., 2019). Therefore, the current study explored the predictive relationships between participation styles and social anxiety in online instructional discussions.

Study Group

Because the data had to be collected online during the pandemic-period, a convenient sampling technique was employed as a practical way to recruit participants. A total of 387 undergraduate university students studying in various departments of the faculties of education from two universities were invited to take part. Both universities located in the Eastern Anatolia region of Turkiye. All students were enrolled on the online-taught "Information Technologies in Education" course. After cleaning the dataset for incomplete entries, 272 participants remained: 156 (57.4%) students from one university and 116 (42.6%) from the other.

Context of the Study

The students were already familiar with the concept of e-learning due to the COVID-19 pandemic, yet they had no substantial e-learning and instructional discussion experience. With respect to technological infrastructure, 189 (69.48%) reported using mobile phones to attend classes while 118 (43.38%) used a cellular data connection to connect to the internet. Demir (2015) reported that 89.2% of university students have a Personal Computer (PC). Demir's ratio is substantially larger than the ratio reached in this study. This is perhaps because Demir collected his data from a university located in a metropolitan city, while the data for this study were collected from two universities located in a much less developed region of Turkiye. Indeed, a considerable number of students have a low socio-economic status and dwell in rural areas with no, or a slow/unstable, internet infrastructure. This results in remarkably high ratios of mobile phone and cellular data connection usage. It is therefore imperative to note that the prevalent usage of mobile phones and cellular data connection was not a preference, but compulsory due to infrastructure and economic problems. According to the Turkish Statistical Institute (TUIK, 2020a), the specific sub-region of the Eastern Anatolia region where the two universities are located has the lowest average household usable income in Turkiye. Notably, 50.8% of households have fixed broadband internet connections whereas 86.9% have mobile broadband internet connections (TUIK, 2020b). These percentiles seem to explain why the students in this study used a mobile broadband connection instead of a fixed connection to attend online classes. In fact, they represent the overall situation in Turkiye, although studying at universities located in a less developed sub-region exacerbates the difficulties involved. Electricity outages and internet connection cuts are also frequent in the region, making e-learning even harder.

Data Collection Tools

Three data collection tools were employed in the current study. These were personal information forms, the learner-learner interaction part of the social anxiety scale for e-learning environments (SASE), and the participation style scale for online instructional discussions (PSOD). The personal information form included information related to university name, gender, device type (i.e., PC, handheld) used to participate in discussions, and the available type of internet connection (i.e., fixed broadband, cellular connection).

Social Anxiety Scale for E-learning Environments (SASE)

The SASE is a 7-point Likert-type scale developed by Keskin et al. (2023). It is a 46-item scale, of which the learner-learner interaction part contains 23 items. This encompasses three factors: "negative evaluation", "somatic symptoms", and "avoidance of interaction". The negative evaluation dimension deals with emotional states such as fear, anxiety, and shame that arise due to misunderstanding, criticism, or negative thinking about the performance of an individual. Somatic symptoms, on the other hand, refer to an individual's various physical symptoms such as sweating, uneasiness, and flushing, depending on the severity of social anxiety. Finally, avoidance of interaction means that an individual refrains from social interactions or avoids performing behaviors so that they do not have to experience social anxiety. The Cronbach's alpha reliability coefficients are .95, .92, and .95, respectively.

Participation Style Scale for Online Instructional Discussions (PSOD)

The 32-item PSOD, which is a 5-point Likert-type scale, was developed by Pala and Erdem (2020). In this more comprehensive study, the online participation styles of learners were divided into two basic categories to determine their participation motivations (Why) and behaviors (How). The goals of learners wishing to participate in an instructional discussion can be addressed using four basic factors: "to socialize", "to get information", "to discuss", and "to fulfill requirements". Learners with the "to socialize" participation style engage in discussion environments to interact with other individuals, to benefit from their views, and to attract attention. Learners with the "to get information" participation style think that discussions contribute to the effective learning process and participate in the social environment for learning. Learners with the "to discuss" participation style take part in discussions in e-learning environments in order to be exposed to different perspectives. Finally, the "to fulfill requirement" participation style refers to participation as a requirement or responsibility of the course. Learners' participation behaviors in online IDFs can also be explained in terms of four different factors: "connective", "analytical", "innovative", and "practical". These factors identify behavioral patterns such as communicating, dealing with details, analytical thinking, problem-solving, and completing tasks. Connective learners are individuals who like to be in contact with other participants and respond to their messages. Those exhibiting analytical participation styles are intensive-thinking and careful individuals who avoid making mistakes and pay attention to details. The innovative group characterizes learners who combine different perspectives, produce subjective and progressive solutions, and reflect on their own experiences, thus bringing authenticity to the medium. Finally, practical participants are individuals focused on quickly completing tasks that aim to fulfill a responsibility. The factors in each dimension can be merged, giving Cronbach's Alpha reliability coefficients of .81, .83, .85, .70, and .89, respectively. Pala and Erdem pointed out that "Why" and "How" dimensions can be employed separately. Following this recommendation, each dimension was investigated separately to scrutinize the simple relationships of the factors within each dimension with other variables.

Implementation Process

Permission to use the scales was obtained from the first authors of the corresponding articles. Ethical approval for this study was obtained from the ethical commission of Van Yuzuncu Yil university. Prior to data collection, the scales were transferred to the Google Form environment because the courses were delivered fully online. Because all students were freshmen and consequently had no substantial online

instructional discussion experience, an intervention including a series of lessons and online instructional discussion questions were designed with the purpose of eliciting their social anxiety and participation styles in e-learning environments. Firstly, the authors prepared seven PowerPoint presentations in accordance with the curriculum of the ''Information Technologies in Education" course. The presentations were cross-checked and improved by the other authors. The topics covered were cyber-bullying, cyber-loafing, internet trolling, information ethics, digital addiction, cyber-security, and information pollution. These topics were already on the course syllabus and were covered over a period of three weeks. In these courses, direct answers to the instructional discussion questions were not given by the authors. Immediately before the start of online instructional discussions, an online discussion guideline explaining the rules to which students must adhere was shared in the Learning Management System (LMS) to create a more effective discussion experience. The guideline stressed six points such as "no copy-paste", "no inappropriate language", and "first, read everything written". In addition to these rules, the course lecturers strived to create a democratic discussion environment where different points of views were celebrated so as to reduce social anxiety and promote creativity. Furthermore, 24 instructional discussion questions related to cyber-awareness were created by the authors. Afterwards, subsequent to the elimination of questions that have a comparatively lower potential for igniting discussion among students, the number of questions was reduced to 10. One was used as a warm-up question to familiarize students with discussions. Three online instructional discussion questions were shared each week after the corresponding cyber-awareness subject was covered in the theoretical part of the lesson. The course was taught in six different sessions with a varying number of students. The students were given extra five points as an incentive for participating in the study. Regarding the role of researchers in the data collection process, two researchers taught the course as a faculty member. One of the two faculty members was present in the discussion environment; however, they did not intervene unless absolutely necessary. Finally, by the time the personal information form, social anxiety scale, and participation style scale were administered online during lessons between 16-31 December 2020, response rates in all discussions had saturated.

Data Analysis

MS Excel 2016 spreadsheet application and IBM SPSS Statistics 24 software package were used to analyze the data. There were no missing data. Multivariate outliers were checked using Mahalanobis distance, which revealed there were no outliers. Mean, standard deviation, frequency and percentile were used to describe the data. Social anxiety and participation styles scores were calculated by averaging all the items in the related factor/scale. "Why" and "How" dimensions of the participation styles scale were analyzed separately. In accordance with the Central Limit Theorem (Kwak & Kim, 2017), the data were normally distributed. Several independent sample t-tests were performed. First, Leneve's test was conducted for each independent sample t-test to assess the equality of variances. Gender, device ownership, and available internet connection type were the independent variables, whereas social anxiety for e-learning environments and participation style for online instructional discussions were the dependent variables. The threshold of statistical significance was accepted as .05. To determine their practical significance, Cohen's *d* effect size statistics were calculated and interpreted based on the recommendation of Sawilowsky (2009), whereby Cohen's *d* can be classified as very small ($d < .1$), small ($d < .2$), medium ($d < .5$), large ($d < .8$), very large ($d < 1.2$), and huge ($d < 2$). Next, multiple linear regression analysis was performed to explore the effect of participation types on social anxiety. First, the Durbin-Watson test for autocorrelation and VIF (Variance Inflation Factor) for multicollinearity were calculated. In line with Cohen's (1992) suggestion, f^2 was calculated to evaluate the effect size of the coefficient of determination (R^2). According to Cohen, f^2 values lower than .02 indicates no effect at all, between .02 and .15 indicates a small effect size, between .15 and .35 indicates a medium effect size and higher than .35 indicates a large effect size.

FINDINGS

The findings of the current study are presented in order of research questions.

Research Question 1: Does Participation Style for Online Instructional Discussion Forums Significantly Differ by Gender (A), Internet Connection (B), and Device Types (C)?

In this study, participation styles were examined separately through the dimensions "Why" and "How". To examine the effect of gender and technological infrastructure on participation styles for online instructional discussion, several independent sample t-tests were conducted and are reported in the Appendix section (Table A1-A3). Only five independent samples t-tests yielded statistically significant results and these are reported in Table 1 (19 results were not statistically significant and are therefore not reported).

Table 1. Differences in participation styles in terms of gender and technological infrastructure

RQ	Dimension/Factor	Group	Category	N	M[a]	SD	t	p	d_{Cohen}
1a	How/Connective	Gender	Male	94	2.24	.86	2.54	.012*	.32
			Female	178	1.99	.75			
1b	Why/To Socialize	Internet Connection Type	Cellular	118	2.58	1.12	2.14	.033*	.26
			Fixed	154	2.30	1.02			
	How/Connective		Cellular	118	2.19	.80	2.14	.033*	.26
			Fixed	154	1.99	.78			
1c	Why/To discuss	Device Type	Handheld[b]	193	3.73	.84	2.13	.034*	.28
			PC	79	3.49	.89			
	How/Practical		Handheld	193	1.92	.75	2.36	.019*	.33
			PC	79	1.69	.60			

**p < .05*

[a] The scale is 5-point Likert-type

[b] There were only four students using tablets in the handheld device category, the remainder comprised mobile phone users

Note 1: df = 270

Note 2: All effect sizes are at the medium level according to Sawilowsky (2009).

As indicated in Table 1, when participation styles are examined in terms of gender, there is a significant difference only in the "connective" factor under the "How" dimension ($p < .05$). Thus, males participate in instructional discussions in a more connective way than females ($t(270) = 2.54$, $p = .012 < .05$, $d = .32$). Students who participated in discussions for social interactions and exhibited connective characteristics mostly had a cellular internet connection ($t(270) = 2.14$, $p = .033$, $d = .26$ and $t(270) = 2.14$, $p = .033 < .05$, $d = .26$ for "to socialize" and "connective" factors, respectively, $p <. 05$). There were also significant differences in terms of device type in the factors of "to discuss" ($t(270) = 2.13$, $p = .034 < .05$, $d = .28$) and "practical" ($t(270) = 2.36$, $p = .019 < .05$, $d = .33$) in favor of handheld device users. All effect sizes were calculated to be at the medium level.

Research Question 2: Does Participants' Social Anxiety Significantly Differ According to Gender (A), Internet Connection (B), and Device Type (C)?

Before addressing the second research question, the correlation coefficients between the constructs related to social anxiety were examined. The results revealed strong positive relationships (varying between .77 and .90 at the .001 significance level) between overall social anxiety score and its factors, which are negative evaluation, somatic symptoms, and avoidance of interaction. Accordingly, social anxiety was considered a single factor scale in the subsequent analyses. Table 2 presents independent samples t-test results regarding the differentiation of participants' social anxiety according to gender (a), internet connection (b), and device type (c).

Table 2. Differences in social anxiety in terms of gender and technological infrastructure

RQ	Group	Category	N	M[a]	SD	t	p	d_{Cohen}
2a	Gender	Male	94	3.01	1.17	.34	.738	NA
		Female	178	2.95	1.38			
2b	Internet Connection Type	Cellular	118	3.19	1.28	2.42	.016*	.30
		Fixed	154	2.80	1.30			
2c	Device Type	Handheld	193	3.12	1.31	3.09	.002**	.42
		PC	79	2.59	1.23			

*p < .05, **p < .01

[a]The scale is 7-point Likert-type

Note 1: df = 270

Note 2: All effect sizes are at the medium level according to Sawilowsky (2009).

The results demonstrate that all means are lower than the critical mid-value 4 of the scale, indicating that students experience relatively low social anxiety. In terms of gender, females and males did not differ in terms of social anxiety ($t(270) = .34$, $p = .738 > .05$). However, the social anxiety scores of participants differed significantly according to internet connection and device type. Accordingly, participants who used cellular connections ($t(270) = 2.42$, $p = .016 < .05$, $d = .30$) and handheld devices ($t(270) = 3.09$, $p = .002 < .01$, $d = .42$) felt more social anxiety in online discussions than those using fixed internet connections and PC. The magnitudes of both effect sizes were medium.

Research Question 3: To What Extent Do Participation Styles Predict Social Anxiety in Online Instructional Discussion Forums?

To answer this research question, a multiple linear regression analysis was performed. The results of the regression model are presented in Table 3.

Table 3. The prediction of social anxiety by participation styles in online instructional discussion forums

Dimension	Factor[a]	M[b]	SD	t	p	β[c]	R^2	f^2	Effect size
Why	To socialize	2.42	1.08	1.55	.123	.106	.011	.011	No
	To get information	3.81	1.01	-4.85	.000***	-.347	.120	.137	Small
	To discuss	3.66	.86	-.61	.540	-.042	.002	.002	No
	To fulfill requirements	3.06	1.11	2.62	.009**	.161	.026	.027	Small
How	Connective	2.08	.79	1.67	.097	.114	.013	.013	No
	Analytical	3.87	.79	3.31	.001**	.228	.052	.055	Small
	Innovative	3.41	.91	-1.78	.076	-.129	.017	.017	No
	Practical	1.85	.72	2.56	.011*	.154	.024	.024	Small

* Significant at.05, ** Significant at.01, *** Significant at.001.

[a]VIF (Variance Inflation Factor) ranged from 1.174 to 1.706, indicating no multicollinearity among predictors in the regression model (Hair et al., 2018)

[b]The scale is 5-point Likert-type

[c]Standardized regression coefficient

Note: The Durbin-Watson statistic was calculated as d = 2.059, which lies between acceptable intervals (Durbin & Watson, 1971).

In Table 3, two factors in both the "Why" and "How" dimensions of participation styles significantly contributed to the regression model. Of these, the "to get information" factor of the "Why" dimension negatively contributed. All of the significant predictors of social anxiety had small effect sizes ($f^2 < .15$). The multiple linear regression analysis revealed that participation styles for online instructional discussions account for 19.1% of the total variance of social anxiety in e-learning environments ($F(8, 263) = 7.785$, $p = .000 < .001$). Mean scores indicate that students mostly participate in IDFs in order "to get information" ($M = 3.81$, $SD = 1.01$) using an analytical approach ($M = 3.87$, $SD = .79$). Also notable is the relatively low mean of the "practical" factor of "How" dimension ($M = 1.85$, $SD = .72$).

DISCUSSION

The affective domain in e-learning literature has been widely neglected. To fill this gap, the purpose of this study was to identify the students' participation styles and their social anxiety levels in the e-learning environment and to reveal in detail the pattern between these two constructs. Specifically, participation style and social anxiety in an IDF were examined in terms of gender and individuals' access to handheld devices and Internet connections. A sample of 272 freshmen university students were recruited and experienced an IDF lasting three weeks, unearthing their participation styles and social anxiety.

The Effect of Gender and Technological Infrastructure on Participation Styles in an IDF

The results indicated that males participate in the instructional discussions in a more connective way than females. Several studies in the literature refer to the effect of gender on online participation behaviors (e.g., Caspi et al., 2008; Diep et al., 2016; Prinsen et al., 2007). The participation patterns of (fe)male participants might differ in classroom discussions depending on the environmental modality (i.e., face to face and online) (Caspi et al., 2008). They adopt distinctly different roles in the online community, especially in terms of social and interaction behaviors. There are conflicting findings in the literature in relation to the contribution of females and males to the discussion environment in terms of the number and length of messages posted (Caspi et al., 2008; Diep et al., 2016; Prinsen et al., 2007). However, the findings in favor of females seem predominant in terms of message length per post. Finally, it should be noted that in the present study, seven other participation styles yielded no gender difference.

The results revealed that students who participated in discussions for social interactions and exhibited connective characteristics mostly had cellular internet connections. More connective individuals, who contribute to the discussions inferentially, try to influence others and engage them in discussions (Pala & Erdem, 2020). Also, handheld device users use IDFs in a practical way for discussion purposes. Discussion-oriented participants, who behave in accordance with their expectations and environmental conditions, tend to learn authentically, placing special emphasis on content and comments in these environments. Practical participants commonly participate in discussions according to external factors shaped by the course, lecturer, and other participants. These participants consider the discussions as a responsibility to be fulfilled, and hence try to fulfill their responsibilities in an optimal way with minimal effort. Handheld device users are likely to have greater agility to participate in discussions than PC users thanks to instant notifications. Thus, they have the opportunity to achieve their goals in a more practical way through the ubiquitous availability of handheld devices. In addition, handheld devices provide more consistent context-awareness. Lan et al. (2012) pointed out that learners exhibit different strategies in an asynchronous discussion environment according to the type of device used. They found that students with handheld devices exhibit a more content-oriented tendency, send more posts, and contribute more to the co-construction of knowledge within the group.

The Effect of Gender and Technological Infrastructure on Social Anxiety in an IDF

In this study, social anxiety as a psychometric construct was examined by gender, type of device, and internet connection used. The results indicate that social anxiety did not differ according to gender in IDFs. By contrast, Asher et al. (2017) and Alsudais et al. (2022) found that women were more prone to suffer from social anxiety. This might be related to the fact that females' online communication self-efficacy levels are

lower than those of males (Demir & Yurdugul, 2015). Another factor that might cause this differentiation in social anxiety is communication styles (Cuming & Rapee, 2010; Newman et al., 2008). Furthermore, when the factors underlying social anxiety are investigated, it becomes apparent that females are worried about emotionality, authority, and workplace, whereas males are anxious about dating and preciseness (Barnett et al., 2021; Xu et al., 2012). In the present study, students could not be provided with an IDF that includes components such as emotionality, certainty, and dating which may elicit gender differences.

Examination of social anxiety according to technological infrastructure revealed that cellular connection and handheld device users are more anxious. Whereas instant notifications are sent from an IDF to individuals who connect to the environment via a handheld device, individuals participating in the education environment via a PC and fixed internet connection become aware of the discussions when they enter the environment in a planned way. In the literature, social anxiety is mostly examined in terms of online and face-to-face interactions (e.g., Blaauw, 2018; Doorley et al., 2020). Social anxiety decreases in communications established in virtual environments. However, as time spent in the online environment increases, the social skills of individuals in normal life decrease, and their social anxiety increases (Karaca et al., 2020). Accordingly, it can be claimed that online platforms are environments where individuals experience less social anxiety, but these environments do not totally eliminate anxiety (Pitcho-Prelorentzos et al., 2020). Smartphone notifications in particular affect individuals negatively in terms of emotional aspects such as depression, anxiety, and boredom proneness (Elhai et al., 2019). Parallel to this, this study found that students who connect to IDFs via cellular connections and handheld devices exhibit more social anxiety than others. Instant notifications coming to these devices from other sources (i.e., social networks, instant messaging applications, and so on) may also cause digital distraction and shift an individual's attention to an off-topic task (Kurt et al., 2021). In the light of all this information, it is concluded that frequent instant notifications and messages sent to learners may be causing social anxiety by creating a Fear of Missing Out (FoMo) on crucial information.

The Prediction of Social Anxiety by Participation Style in an IDF

The predictability of social anxiety by participation styles for IDFs was also tested. It was found that there was no predictability of "to socialize" and "to discuss" factors in the "Why" dimension nor was there predictability of "connective" and "innovative" factors in the "How" dimension. Regarding the socialization factor, participations exhibiting this kind of participation style like interaction, receiving attention, and feedback on their comments (Pala & Erdem, 2020). Nonetheless, the LMSs utilized in the current study had no emoji feature and had a primitive reply system. This substantially limited the ways in which the impact of a particular post could be measured. In addition, the overwhelming majority of students preferred to directly reply to questions rather than to the comments of other participants. Such shortcomings of the LMSs used and the participation patterns of students might have directed social participants to professional social networking sites to socialize, as these have the features they desire. As a result of not being able to measure the impact of their posts and compare it with others, in contrast to professional social networking sites, users seem to experience little or no social anxiety. Regarding the "to discuss" and "innovative" factors, individuals who aim to engage in discussion feel the need to make comments when they identify a different perspective in the discussions and view the latter as an authentic source of learning (Sansone et al., 2018). Discussion-oriented and innovative individuals disengage from the discussion as a result of repetition of similar views (Pala & Erdem, 2020). Merely posting a message to a discussion forum does not always mean that students are engaged in a dialogue or discussion (Salter & Conneely, 2015). In line with the above interpretation of results in relation to the socialization factor, the large number of responses sent directly to discussion questions rather than others' posts may have limited the emergence of conflict or provocation. It may also have mitigated the effect of social anxiety as the main motivation of students in this participation style is the emergence of conflict points and provocative comments.

The results revealed that two factors in each dimension of "How" and "Why" significantly predicted social anxiety, despite yielding small effect sizes. The analytical and practical participation behaviors and the purpose of fulfilling requirements positively predicted social anxiety, whereas the purpose of obtaining information in IDFs negatively predicted it. Information-oriented individuals have a tendency to make conceptual interpretations. These individuals typically focus on details in the subject area to become competent in discussions. The presence of the lecturer in the environment and the density of informative posts have a

positive effect on the participation of students in this group. Nonetheless, not giving feedback to posts is likely to affect the social anxiety levels of students with this participation style. Individuals with an analytical participation style peruse posts and ponder before posting as they are afraid to make mistakes (Pala & Erdem, 2020). Because they are focused on quality, they prefer to participate less in online discussions in order not to make errors (Wise et al., 2014). However, when they do engage, they seem to be confident about their posts, not heeding how others might receive them. Moreover, the authors created a democratic and respectful atmosphere in IDFs. In addition, it was concluded that in IDFs, practical participation behaviors and the aim of fulfilling the requirements also predict social anxiety. Practical learners are focused on quickly completing tasks that aim to fulfill a responsibility. The users in this group mostly participate in discussions due to extrinsic motivation factors, and are generally unwilling participants (Pala & Erdem, 2020; Phirangee et al., 2016). These extrinsic motivational factors are also thought to be the primary source of social anxiety in this kind of learner. The fact that participation in IDFs was voluntary seems to lessen the impact of these extrinsic motivation factors on social anxiety.

CONCLUSION

In sum, it was concluded that handheld devices and cellular internet data, create more social anxiety while connecting to IDFs. In addition, ICT availability or preferences for accessing the discussion platform played a determining role in some participation styles. Students who participated in discussions to complete course tasks experienced social anxiety, while those whose aim was to gain knowledge and to discuss were not exposed to such anxiety. It is important to note here that Pala and Erdem's (2020) "Why" dimension of participation styles for IDFs can be classified into two theoretical sub-dimensions: Extrinsic and Intrinsic motivators to participate. With regard to the current study, it was found that students' participation in discussions as a result of an extrinsic motivator or necessity ("to fulfill requirement") caused social anxiety. In essence, they cause a feeling of avoidance (Anjomshoa & Sadighi, 2015). Conversely, intrinsic motivators ("to socialize" and "to discuss") did not cause social anxiety. In short, the results of this study emphasize the crucial role of intrinsic motivation in encouraging people to participate in IDFs. Thus, the current study has vital implications for both researchers and practitioners in an extraordinary period when the formal dimension of learning is becoming more intertwined with our daily lives due to the e-learning activities we are all partaking in during the pandemic period. Awareness of the participation style and social anxiety of students can produce fruitful inferences that will help determine appropriate types of interventions for students who are low-achieving and at risk of drop-out.

LIMITATIONS AND SUGGESTIONS

Limitations

This study has several limitations that need to be addressed. First, social anxiety in e-learning environments was measured on a self-report scale. Such measures cannot accurately reflect learner behaviors and characteristics. Second, the LMSs (or IDFs in this context) used in this study were not as interactive and usable as the social networking sites students are familiar with. They did not support emojis and had reply systems with some usability problems. Third, the relatively small sample did not allow two-way ANOVA to be conducted between device type and internet connection type due to the low number of observations in the crosstabs.

Avenues for Future Research

Further scholarly attention may focus on measuring participation styles for an IDF through actual participation data such as log records. For instance, it would be instructive to compare participation styles obtained through self-report and log records. In addition, although the study sample was scattered across six different classes varying in size from 21 to 150, the effect of class size on participation behaviors was not examined. Yet group size possibly affects participation styles. Studies have reported that a large group size decreases active participation and increases passive follow-up in discussions (Ruthotto et al., 2020). In this research, students used handheld devices simply because they could not afford to purchase PCs. This begs

the question: "Do income levels impact social anxiety and participation styles for IDFs over device type?" In short, "is device type mediating this relationship?" The authors could not collect income levels as this is sensitive data. Complicating this possible relationship, the authors came to realize that a small number of students attended classes with handheld devices merely because they were ubiquitous, despite having a PC. This raises another question: "What are the roles of mandatory and volunteer hand-held device usage in IDFs". Mixed-research design studies can therefore be carried out to shed light on these issues.

Directions for Practitioners

Practitioners of e-learning should be taking a number of precautions to reduce the social anxiety students experience in IDFs. They are supposed to stress that sending "comprehensive and well-thought" answers in IDFs are more valuable and beneficial than sending "quick and unprobed" answers and that students will be graded not on the number of posts they send, but on the quality so that they feel less pressure due to the instant notifications of handheld devices. This will help to reduce levels of social anxiety. This study puts forward several suggestions for the construction of IDFs based on its findings. Some students have difficulty reading all the comments in the discussion thread and so returning to the forum poses a challenge for them (Walji et al., 2016). Discussion threads include many different types of posts and interaction patterns. Categorizing the posts in the IDFs (e.g., in accordance with a knowledge building perspective) might alleviate the anxiety levels of students with different participation types (e.g., analytical style) by filtering out posts more suitable for them (Scardamalia & Bereiter, 2006). Such epistemological markers or tags to posts will give students an opportunity to preview the posts in the course of a general discussion. Similarly, statistics about affective responses and discussion metrics will stimulate students to approach the discussion topic or problem in accordance with their preferred approach. The aforementioned suggestions might constitute a basis for creating a discussion environment that adapts itself to the pre-measured participation styles of learners in order to reduce levels of social anxiety.

Authors's Note: The research was supported by funding from the Van Yuzuncu Yil University Scientific Research Projects Department through the project number SYD-2021-9505.

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APPENDIX

Table A1. The effects of gender and technological infrastructure on participation style

Dimension	Factor	Gender	*N*	*M*[a]	*SD*	*t*	*p*	d_{Cohen}
Why	To Socialize	Male	94	2.55	1.03	1.47	.144	NA
		Female	178	2.35	1.10			
	To get information	Male	94	3.65	1.02	1.91	.057	NA
		Female	178	3.89	.99			
	To discuss	Male	94	3.73	.85	.87	.387	NA
		Female	178	3.63	.87			
	To fulfill requirements	Male	94	2.99	1.08	.72	.469	NA
		Female	178	3.09	1.12			
How	Connective	Male	94	2.24	.86	2,54	.012*	.32
		Female	178	1.99	.75			
	Analytical	Male	94	3.78	.86	1.29	.197	NA
		Female	178	3.91	.75			
	Innovative	Male	94	3.44	.89	.45	.197	NA
		Female	178	3.39	.92			
	Practical	Male	94	1.94	.73	1.45	.147	NA
		Female	178	1.81	.71			

[a] *It is the mean item scores of a 5-point Likert-type scale. df = 270, *p < .05.*

Table A2. The effects of Internet connection type on participation style

Dimension	Factor	Internet connection type	N	M[a]	SD	t	p	d_{Cohen}
Why	To Socialize	Cellular	118	2.58	1.12	2.14	.033*	.26
		Fixed	154	2.30	1.02			
	To get information	Cellular	118	3.91	.93	1.40	.161	NA
		Fixed	154	3.73	1.06			
	To discuss	Cellular	118	3.74	.78	1.27	.206	NA
		Fixed	154	3.61	.92			
	To fulfill requirements	Cellular	118	3.03	1.15	.33	.742	NA
		Fixed	154	3.08	1.07			
How	Connective	Cellular	118	2.19	.80	2.14	.033*	.26
		Fixed	154	1.99	.78			
	Analytical	Cellular	118	3.94	.73	1.23	.220	NA
		Fixed	154	3.82	.82			
	Innovative	Cellular	118	3.49	.83	1.24	.217	NA
		Fixed	154	3.35	.97			
	Practical	Cellular	118	1.88	.74	.46	.644	NA
		Fixed	154	1.83	.70			

[a] *It is the mean item scores of a 5-point Likert-type scale. df = 270, *p < .05,*

Table A3. The effects of device type on participation style

Dimension	Factor	Device Type	N	M[a]	SD	t	p	d_{Cohen}
Why	To Socialize	Handheld	193	2.50	1.10	1.79[b]	.075	NA
		PC	79	2.24	.98			
	To get information	Handheld	193	3.86	1.01	1.27[b]	.206	NA
		PC	79	3.69	1.01			
	To discuss	Handheld	193	3.73	.84	2.13[b]	.034*	.28
		PC	79	3.49	.89			
	To fulfill requirements	Handheld	193	3.12	1.13	1.42[a]	.156	NA
		PC	79	2.91	1.05			
How	Connective	Handheld	193	2.12	.77	1.48[b]	.141	NA
		PC	79	1.97	.84			
	Analytical	Handheld	193	3.89	.75	.75[c]	.454	NA
		PC	79	3.81	.86			
	Innovative	Handheld	193	3.43	.90	.56[b]	.576	NA
		PC	79	3.36	.93			
	Practical	Handheld	193	1.92	.75	2.36[b]	.019*	.33
		PC	79	1.69	.60			

[a] *It is the mean item scores of a 5-point Likert-type scale.* [b]*df = 270,* [c]*df = 129.15, *p < .05,*

THE IMPACT OF DIGITAL TRANSFORMATION AND LEADERSHIP ON ORGANIZATIONAL RESILIENCE IN DISTANCE EDUCATION INSTITUTION: HIGHER-ORDER SEM APPROACH

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Received: 05/03/2023 **Accepted:** 11/09/2023

ABSTRACT

To overcome the difficulty and unprecedented suspensions due to the COVID-19 pandemic, every organization is required to consider strategic steps to sustain, one of which is by implementing digital transformation and developing leadership capability. This study aims to determine the impact of digital transformation and leadership capability in maintaining the organization, particularly in distance education. This study used questionnaires distributed to 402 students to obtain their opinions on digital transformation, leadership capability, and organizational resilience in Universitas Terbuka, a founder of distance education institutions in Indonesia. Data were analyzed using descriptive and Higher-Order Structural Equation Modeling analysis. Based on the modelling, it is shown that the modelling had a good value of the Goodness of Fit Indicator through a standardized loading factor (SLF) more than the tolerable loading factor limit (>0.50). The Variance Extracted (VE) and Construct Reliability (CR) values also showed that the questions on every indicator used in this study were sufficiently measurable and reliable. The results of hypothesis testing indicated that there was a positive and significant impact of digital transformation and leadership capability on the organizational resilience of Universitas Terbuka.

Keywords: Digital transformation, distance education institution, leadership capability, organizational resiliency, higher-order SEM.

INTRODUCTION

The COVID-19 pandemic caused severe and unprecedented disruption, considered one of humanity's tragedies. This pandemic has had an impact on almost all aspects of life, including education. The necessity to conduct the Covid-19 health protocol, including minimizing outdoor activities, has become a new habit represented in a new governmental regulation to conduct every activity through digital media/online networks during the pandemic.

The COVID-19 pandemic causes organizations to be able to think of strategic steps to sustain in the middle of this uncertain condition. The resilience of an organization becomes an absolute matter to achieve. Resilience is derived from the words resilience and resilient which in Latin means rise back or jump back (Williams et al., 2017) Organizational resilience refers to capability of a firm to effectively absorb, develop situation-specific responses, and ultimately engage in transformative activities to take advantage of disruptive shocks that have the potential to threaten the sustainability of organization (Williams et al., 2017). According to Corrales-Estrada et al (2021); Mokline & ben Abdallah (2021); Sahebjamnia et al., (2018) , organizational resilience is defined as the dynamic capability to respond during times of disruption and crisis, especially in the face of COVID-19 pandemic, organizations need to strengthen its resilience by engaging stakeholders, promoting virtual work, and encouraging customer communication.

According to Velu et al., (2019), digitalization is an effective way for organizations to achieve organizational resilience. The demand to shift to digital media for the sustainability of processes/activities during the pandemic is increasing Hadiono et al (2020). In other words, the pandemic can be interpreted as the door to the transformation of conventional education into digital education. The shift in using teaching media and learning resources toward digitalization makes all education stakeholders willing to change and leave their comfort zone. With the global impact of the pandemic, increasing efficiency, social coordination, and resource allocation as the constituent factors of digitalization are variables that significantly influence organizational recovery.

Universities as institutions of higher education are also required to be responsive to this phenomenon by constantly innovating so that the learning process can be conducted effectively. When the situation changes to a situation that focuses more on the use of digital technology, digital transformation is an inevitable phenomenon.

Digital transformation, in general, can be interpreted as a radical process that occurs in organizations by utilizing technology, human resources, and processes that cause the performance of the organization to change drastically (Boulton, 2021). Digital transformation is a process in which the digital world merges with the physical world (Yoo et al., 2010). The main objective of carrying out digital transformation relates to the digital readiness of the organization to ensure that the organization is ready to enter the digital world and is ready to change as needed (Osmundsen et al., 2018).

The digital transformation of an organization involves integrating internal and external resources through information technology, computing, communication, and connectivity to reshape the vision of the organization, strategy, organizational structure, processes, capabilities, and culture to adapt to the ever-changing digital world (Vial, 2019). Digital transformation relies on the capabilities and digital technology to create or change business processes, operational processes, and customer experiences to create new values (Morakanyane et al., 2017). Rogers (2016) conveyed that besides technology-related issues, digital transformation is also related to a strategy in which leadership or managers must be able to find ways to create an innovation and a new business model and can also optimize customer needs and experience. In line with this opinion, Weller et al (2013) also stated that digital transformation allows organizations to sustain themselves in an era of rapid change; however, this transformation still requires strategic direction from the leader.

On the other hand, leadership is the executive power that enables the organization to sustain itself (Lisdiono et al., 2022). Stakeholder leadership is an important component of a strategic management framework that can drive organizational resilience (Schoemaker et al., 2018). Leaders assist organizations in adapting to their environment by directing, guiding, and supporting their subordinates (Taylor et al., 2014). Based on a study conducted by Shin & Park (2021), it is stated that leadership creates superior resilience performance. Strong leadership is required to execute organizational strategies that promote resilience by rapidly changing entire organizational systems and adaptability.

Dynamic and strategic leadership capabilities are required to be able to cooperate to help organizations sustain the increasingly volatile, complex, and uncertain business environment. According to Khan et al (2019) and Lee et al (2013), leaders should view risk and uncertainty as natural business elements and should prepare for all possible future scenarios aggressively and pre-emptively. With a capable leader, the organization is able to overcome further risks and challenges.

Research related to the digital transformation indicators in Universitas Terbuka has been carried out by Khurniawan et al., (2022). Based on this research, it was found that strategy and institutional governance, curriculum and delivery methods, assessment, staff support and professional development, and infrastructure and resources are indicators of digital transformation that digital transformation is appropriate to measure the digital transformation at the Open University. Therefore, the author aims to develop that research by applying those indicators to examine the impacts of digital transformation and leadership on the resilience of Universitas Terbuka.

LITERATURE REVIEW

Organizational Resilience

Resilience is derived from the words *resilience* and *resilient* which in Latin means rise back or jump back (Williams et al., 2017). According to Holling (1973), resilience can also be understood as a measure of the persistence of a system and adaptability to changes or disturbances while still maintaining the same relationship between population or state variables. Organizational resilience refers to the capability of a firm to effectively absorb, develop situation-specific responses, and ultimately engage in transformative activities to take advantage of disruptive shocks that have the potential to threaten the sustainability of organization (Williams et al., 2017). In relation to organizational resilience as a dynamic capability to respond during suspensions and crises, especially in the face of this COVID-19 pandemic, organizations are required to strengthen their resilience by engaging stakeholders, promoting virtual work, and encouraging customer communication (Corrales-Estrada et al., 2021; Mokline & ben Abdallah, 2021; Sahebjamnia et al., 2018).

There are three characteristics of organizational resilience: perception, integration and coordination, and reorganization (Williams et al., 2017). Based on the perceptual characteristics, it is found that organizational resilience is the capability of the organization to adapt to environmental changes; while companies with higher organizational resilience are good at finding early warning signals in a crisis. While based on integration and coordination, organizational resilience can increase the flexibility of the organization to mobilize internal and external resources to overcome external crises. On the other hand, based on reorganization, organizational resilience allows the organization to reconfigure its resources and capabilities and complete the necessary internal and external transformations.

The characteristics of a resilient organization firstly can be defined as capable of creating and customizing structures. With these characteristics, an organization can perform a precise and timely decision-making process that allows it to operate independently with physical, and digital operating systems. Secondly, a resilient organization can be characterized to be able to ensure security. With security assurance, resilience can be achieved to continuously manage and reduce possible risks during change. Thirdly, emotional-effect management is also a characteristic of a resilient organization. Experiencing constant transformation and change is a factor in producing elevated levels of anxiety, stress, and overwork in teams. Therefore, it can reflect the commitment to leadership-level management and ensure the health and stability of the employees of the organization by advocating for organizational resilience. Fourthly, promoting a diverse and empowered workforce is also a representation of the characteristics of a resilient organization. In this manner, a resilient organization has the power to build a well-connected, collaborative, and creative workforce that works together to develop competitiveness and prosperity. Lastly, a strong organization can be characterized by consistently learning, evolving, and growing. By investing in physical and digital infrastructure, a strong organization can be more adaptable and flexible in the long term.

Organizational resilience has two perspectives which are operational resilience and strategic resilience (Lengnick-Hall et al., 2011). Operational resilience focuses on overcoming crises and bouncing back to previous conditions which are often associated with interpretive and adaptive action capabilities and are also called passive resilience (Somers, 2009). On the other hand, active resilience or strategic resilience can be defined as the capability to quickly transform threats into opportunities then identify unique opportunities and act effectively when they compete (Valikangas & Georges L. Romme, 2012).

Hall & Winn (2010) applied the concept of resilience to education, particularly in open education, arguing that resilience develops engagement, education, empowerment, and encouragement. In terms of higher

education practice, resilience is a representation of leveraging technology to change practice and maintain the fundamental function and identity that existing practice represents. As a sustainable college, it must have the capacity to accommodate students, staff, and wider society to develop resilience since technology offers reach, usability, accessibility, and timely feedback; these are the keys to developing the resilience for higher education.

According to Walker et al., (2004), resilience can be categorized into four aspects: latitude, resistance, precariousness, and panarchy. Latitude can be defined as the maximum amount the system can change before it loses its ability to recover. Jones et al., (2009) summarized based on three main factors: distance or open learning, resources, and systematic support. Resistance can be defined as the ease or difficulty of changing the system. Precariousness relates to how close the current state of the system is to the threshold and how panarchy deals with the influence of external forces at low and high scales. For example, external oppressive politics, invasions, market shifts, or global climate change can trigger local shocks and regime shifts.

The rapid development of digital technologies, such as artificial intelligence, big data, cloud computing, blockchain, and the industrial internet, shifts the traditional economy into a digital and intelligent economy that becomes an important mechanism for organizations to achieve breakthrough innovation and sustainable development (Vial, 2019). Digital transformation has become an important pathway for organizations to increase organizational resilience and has been widely researched, both by academic and business practices (Zhang et al., 2021). Especially in the era of the COVID-19 pandemic, based on the International Data Company Survey, it is estimated that direct investment in digital transformation will exceed USD 6.8 trillion from 2020 to 2023.

Digital Transformation

Digital transformation, in general, can be interpreted as a radical process that occurs in organizations by utilizing technology, human resources, and business processes that cause the business performance of the organization to change drastically (Boulton, 2021). According to Yoo et al., (2010), digital transformation is a process in which the digital world merges with the physical world. Digital transformation is an evolutionary process that relies on capabilities and digital technology to create or change business processes, operational processes, and customer experiences to create new value (Morakanyane et al., 2017). The main purpose of realizing digital transformation by an organization is related to the digital readiness of the organization. In other words, the organization is required to ensure its readiness to enter and adapt to the digital world as demanded (Osmundsen et al., 2018).

Digital transformation is not only about how an organization implements a digital technology, but also about how to combine strategy with today's technology. Rogers (2016) implied that digital transformation is basically about both technology and strategy; therefore, it can also be said that leadership or managers must be able to find ways to utilize and use them to create an innovation and to create a new business model, and can also optimize customer needs and experience. Some fields that have made this transformation such as education with its e-learning, business with e-business, banking with e-banking, government with e-government, and many others, aim to increase the efficiency and effectiveness of work and complementary files by using a database.

Digital transformation is obtained from the use of a combination of digital innovations that result in changes to the structure, values, processes, positions, or ecosystems within the organization and its external environment (Hinings et al., 2018). This process is seen as forcing organizations to cope with change and uncertainty shocks (Scholz et al., 2020). The digital transformation of an organization involves integrating internal and external resources through information technology, computing, communication, and connectivity to reshape the vision of the organization, strategy, structure, processes, capabilities, and culture to adapt to the fast-changing digital world (Vial, 2019). Digital transformation can be used to change the way organizations create value, exchange value, and interact directly with consumers (Yadav & Pavlou, 2014). The impacts that can be seen when digital transformation occurs according to Schwarzmuller et al., (2018) are a) Teleworking and b) employee substitution.

Leadership

Leadership is the executive power that enables the organization to sustain itself (Lisdiono et al., 2022). Leaders are the first line to initiate an idea among other stakeholders (Fiksel et al., 2015). Stakeholder leadership is an important component of a strategic management framework that can drive organizational resilience (Schoemaker et al., 2018).

Leaders assist organizations in adapting to their environment by directing, guiding, supporting, and providing support to their subordinates (Taylor et al., 2014). A study conducted by Shin & Park, (2021) addressed that leadership creates superior resilience performance. Strong leadership is required to execute organizational strategies that promote resilience by simultaneously changing entire organizational systems and adapting to change. In addition to leadership, dynamic and strategic leadership capabilities are also required to be able to cooperate in assisting organizational sustainability against business challenges, complexity, and uncertainties. According to Khan et al., (2019) and Lee et al., (2013), leaders should view risk and uncertainty as natural business elements and should prepare for all possible further scenarios aggressively and pre-emptively. With a capable leader, the organization is believed capable of facing the crisis while maintaining its sustainability.

An effective leader is represented as a leader who uses an integrated transformational and transactional leadership style (Bass, 1985). A leader is required to implement strategic resilience to anticipate and prevent crises and continue to make changes with or without crises. Leadership capabilities can assist in ensuring the resilience of the organization (Lisdiono et al., 2022). According to Lengnick-Hall et al., (2011) and Morales et al., (2019), organizational resilience depends on a strong leadership style that encourages a united and interdependent team to work together. Leaders must be able to detect challenging situations during difficult times as early as possible. They define and decide their performance, coordinate vertically and horizontally, and provide understanding and guidance to the team with clear and effective communication; at the same time, they create, develop and increase the resilience of the team.

A leader is required to possess at least 3 (three) leadership abilities: (1) technical ability, (2) social ability, and (3) conceptual ability. Technical ability is the ability of the leader to use the knowledge, methods, and equipment needed to execute certain tasks that are obtained through education, experience, and training. Theoretically, a leader must have the abilities as described; however, it is seen that the facts and data from the research show that the recruitment of officials to be appointed to a certain position or job does not meet the education, experience, and training standards possessed by the relevant position and job. This condition is caused by the fact that the leader who is authorized to select talents to occupy a position or job does not recruit talents based on the job requirements but based on personal interests (likes and dislikes) although the appointed talents do not have the capacity for the position or job.

Social ability is an ability possessed by a leader to supervise which includes an understanding of motivation and the application of effective leadership. This kind of ability requires a separate understanding by each leader in encouraging subordinates. Conceptual ability is the ability of a leader to understand the complexity of the organization. This ability is also used in adapting the field of work of the work unit into the entire operational field of the organization. Therefore, every leader must fully understand the movements of their respective work units in executing their main tasks and functions.

METHOD

The data used in this study were categorized into two types of data: secondary data and primary data. Secondary data were obtained by reviewing literature studies such as literature and references related to other sources outside the organization that could support the research. Primary data were obtained by distributing online questionnaires to students of Universitas Terbuka.

Participants

The sample of this study were 402 participants from 5 faculties of Universitas Terbuka: Faculty of Economics (FE); Faculty of Law, Social and Political Sciences (FLSP); Faculty of Teacher Training and Education (FTTE); Faculty of Science and Technology (FST), and Post-graduate Program (PP). All participants were chosen based on their active status in the Open University randomly. The participants then were asked to fill out the questionnaire.

Instrument and Procedures

The instrument consists of 57 questions of which 11 questions were related to respondent characteristics and the other 46 questions were to measure digital transformation (X1) and leadership capability (X2) variables, as exogenous latent variables, and organizational resilience (X3), as endogenous latent variables. Additionally, every question had four options to choose from: 1) completely disagree, 2) disagree, 3) agree, and 4) completely agree.

The research was conducted in several stages, starting with formulating research problems, selecting research objectives, finding reference sources, determining variables, forming research models, collecting data, analyzing data, formulating research results, and recommending research through managerial implications.

Data Analysis

The data analysis technique used is descriptive analysis and structural equation modeling (SEM) analysis. Descriptive analysis was used to determine the characteristics of the students as the research respondents. Meanwhile, higher order SEM analysis was used to examine the effect of digital transformation that was in a higher level of abstraction including several subcomponents and the effect of organizational leadership on organizational resilience as proposed in the model as shown below.

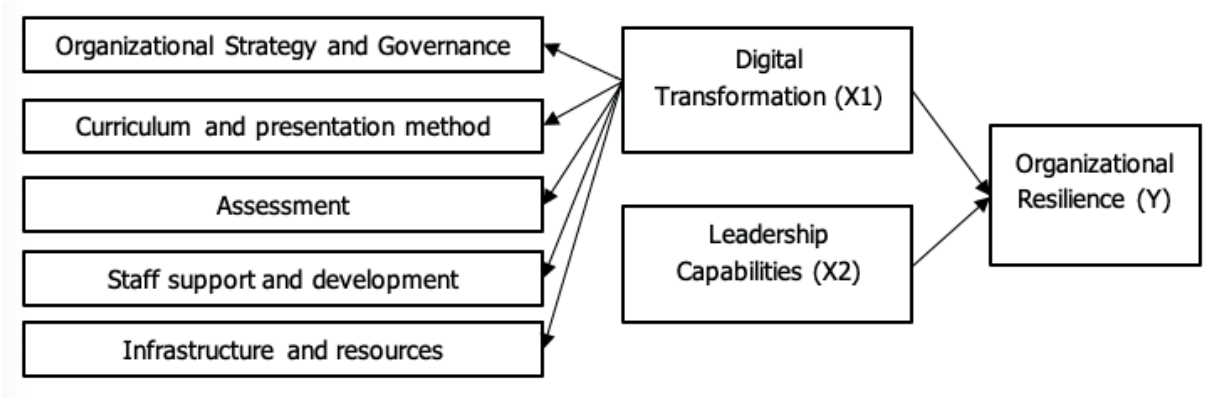

Figure 1. Model the relationship between digital transformation and digital capabilities on organizational resilience

FINDINGS

Descriptive Analysis

This study involved 401 students from 5 faculties: 35.57% from FTTE, 33.08% from FLSP, 25.87% from FE, 4.23% from FST, and 1.24% from PP taken from 31 provinces in Indonesia as shown in Table 1. Based on gender, most respondents were female respondents of 64.68%, and only 35.32% were male students. The age range of respondents was quite diverse. Respondents were dominated by students aged >26 years of 66.92%, followed by students aged 23-24 years of 22.14%.

Respondents who were student representatives from semester 1 to semester 15 where most of the respondents were students in semester 15. There was 1 of 4 students who was a respondent as a semester-15 student. Then followed by students in semester 8, which was around 15 %. On the other hand, about 2 out of 3 students were students who study while working, with the majority of private employees (60.38%), civil servants (11.64%), self-employed (5.66%), and others (22.32%). On average, these employed respondents had worked for 4-6 years (31.45%), >10 years (26.42%), and 1-3 years (23.90%).

Table 1. Descriptive Statistics of Respondents

Variables	Category	Number	Percentage (%)
Faculty	FE	104	25.87%
	FLSP	133	33.08%
	FTTE	143	35.57%
	FST	17	4.23%
	PP	5	1.24%
Gender	Male	142	35.32%
	Female	260	64.68%
Age	<19 Years Old	3	0.75%
	19-22 Years Old	41	10.20%
	23-26 Years Old	89	22.14%
	>26 Years Old	269	66.92%
Semester	1	5	1.24%
	2	30	7.46%
	3	40	9.95%
	4	19	4.73%
	5	9	2.24%
	6	24	5.97%
	7	38	9.45%
	8	63	15.67%
	9	33	8.21%
	10	7	1.74%
	11	1	0.25%
	13	10	2.49%
	14	26	6.47%
	15	97	24.13%
Occupational Status	Unemployed	84	20.90%
	Employed	318	79.10%
Types of Occupation	Unemployed	83	20.65%
	Others	72	17.91%
	Civil Servant	37	9.20%
	Private Employee	192	47.76%
	Self-employed	18	4.48%

Higher-order SEM Analysis

The analysis used in this study was Structural Equation Modeling (SEM). According to Ferdinand (2002), SEM is a type of multivariate analysis in social science that can simultaneously test complex research models and analyze variables that cannot be directly measured. SEM analysis allows researchers to analyze the relationship between many independent variables with one or more dependent variables. SEM allows the pattern of attachment and causality to become one pattern. SEM also allows analysis between several dependent and independent variables directly.

According to Ghozali & Latan (2012), SEM can be defined as a combination of two separate statistical methods which are factor analysis developed in psychology and psychometry and simultaneous equation modeling developed in econometrics. SEM can also be seen as a second-generation multivariate analysis technique that combines factor analysis and path analysis to enable researchers to simultaneously test and

estimate causal relationships between multiple exogenous and endogenous variables with multiple indicators. In addition, SEM is appropriate for researchers to confirm the research model and empirical evidence in the field with research results supported by a detailed explanation of the forming variables and the relationship of one variable to other variables.

Overall Model Fit Test is conducted by analyzing the goodness of fit indicators shown in Table 3. RMSEA is an index that can be used to compensate for chi-square statistics in large samples (Baumgartner & Homburg, 1996). The RMSEA value indicates the expected goodness of fit when the model is estimated in the population (Hair et al., 2010). RMSEA value that is smaller than or equal to 0.08 is a condition for acceptance of the model which shows the criteria for good fit; it can be said that the model is based on the degree of freedom (Browne & Cudeck, 1993). Based on the calculation results, the RMSEA value was 0.08, which means that the model was acceptable and had the good fit category. Likewise, RMR was 0.025 which means the model was a good fit as well. Based on the obtained values, it can be concluded that the entire model built had the appropriate value (goodness of fit statistics) and the structural model had met the specified criteria so that the model built could explain empirical information based on the data collected.

GFI (Goodness of Fit Index) is a non-statistical measure that has a range of values between 0 (poor fit) to 1.00 (good fit). A high value in this index indicates the model is a better fit. Based on the results of the analysis, the GFI value was 0.71; therefore, the model in this study was categorized in the almost good fit rating. AGFI (Adjusted Goodness of Fit Index) shows the recommended level of acceptance if it has a value equal to or greater than 0.90 (Hair et al., 2010). GFI and AGFI are criteria that consider the weighted proportion of variance in a sample covariance matrix (Ferdinand, 2002). A value of 0.95 can be interpreted as a good level. Based on the calculation results, the AGFI value was 0.68, which means the model could be accepted at a good level and was categorized in the almost good fit rating.

Table 2. Result of Overall Model Fit Testing

Goodness of Fit Indicators	Cut-off-Value	Test Result	Fit Rating
Root Mean Residual (RMR)	≤ 0.1	0.025	Good fit
Root Mean Square Error of Approximation (RMSEA)	≤ 0.08	0.08	Good fit
Normed Fit Index (NFI)	≥ 0.90	0.93	Good fit
Non Normed Fit Index (TLI or NNFI)	≥ 0.90	0.95	Good Fit
Comparative Fit Index (CFI)	≥ 0.90	0.95	Good fit
Incremental Fit Index (IFI)	≥ 0.90	0.95	Good fit
Relative Fit Index (RFI)	≥ 0.90	0.93	Good fit
Goodness of Fit Index (GFI)	≥ 0.90	0.71	Almost Good fit
Adjusted Goodness of Fit Index (AGFI)	≥ 0.90	0.68	Almost Good fit

Measurement Model Fit Test with validity and reliability tests. Validity concerns the level of accuracy achieved by an indicator of an assessment (Ferdinand, 2002). An indicator variable is said to be valid when it has a Standardized Loading Factor (SLF) value that is more than the tolerable limit of the loading factor or 0.50 and has a t-value above 1.96. The suitability test for the initial measurement model can be seen in Figure 2.

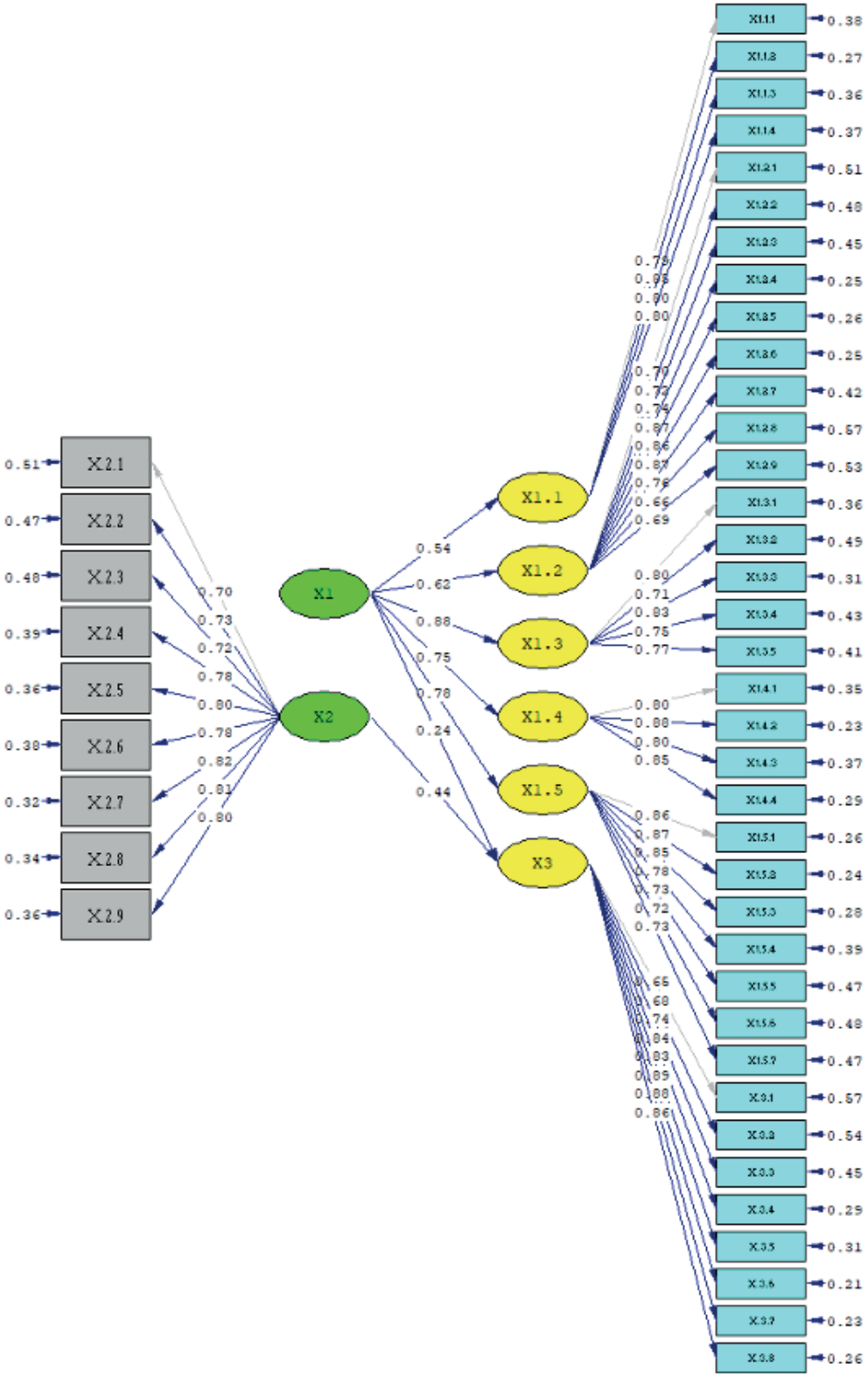

Figure 2. the standardized loading factor of higher order SEM

Based on Figure 2 and Table 3, it is found that all indicators had SLF > 0.5 and t-value > 1.96. This indicates that every constituent indicator had been able to measure its respective dimensions and variables.

Table 3. Results of Measurement Model Fit Test

Latent Variables	Indicator	Loading factor	T-Value	Status
X1.1	X1.1.1	0.79	-	Valid
	X1.1.2	0.85	17.98	Valid
	X1.1.3	0.80	16.68	Valid
	X1.1.4	0.80	16.65	Valid
X1.2	X1.2.1	0.70	-	Valid
	X1.2.2	0.72	13.79	Valid
	X1.2.3	0.74	14.18	Valid
	X1.2.4	0.87	16.54	Valid
	X1.2.5	0.86	16.39	Valid
	X1.2.6	0.87	16.52	Valid
	X1.2.7	0.76	14.53	Valid
	X1.2.8	0.66	12.64	Valid
	X1.2.9	0.69	13.22	Valid
X1.3	X1.3.1	0.80	-	Valid
	X1.3.2	0.71	15.07	Valid
	X1.3.3	0.83	18.29	Valid
	X1.3.4	0.75	16.22	Valid
	X1.3.5	0.77	16.61	Valid
X1.4	X1.4.1	0.80	-	Valid
	X1.4.2	0.88	20.05	Valid
	X1.4.3	0.80	17.64	Valid
	X1.4.4	0.85	19.07	Valid
X1.5	X1.5.1	0.86	-	Valid
	X1.5.2	0.87	23.15	Valid
	X1.5.3	0.85	22.10	Valid
	X1.5.4	0.78	19.27	Valid
	X1.5.5	0.73	17.28	Valid
	X1.5.6	0.72	17.07	Valid
	X1.5.7	0.73	17.19	Valid
X1	X1.1	0.54	9.50	Valid
	X1.2	0.62	10.48	Valid
	X1.3	0.88	15.76	Valid
	X1.4	0.75	13.47	Valid
	X1.5	0.78	15.05	Valid
X2	X.2.1	0.70	-	Valid
	X.2.2	0.73	13.95	Valid
	X.2.3	0.72	13.78	Valid
	X.2.4	0.78	14.97	Valid
	X.2.5	0.80	15.28	Valid
	X.2.6	0.78	14.98	Valid
	X.2.7	0.82	15.69	Valid
	X.2.8	0.81	15.44	Valid
	X.2.9	0.80	15.28	Valid
X3	X.3.1	0.65	-	Valid
	X.3.2	0.68	12.19	Valid
	X.3.3	0.74	13.2	Valid
	X.3.4	0.84	14.6	Valid
	X.3.5	0.83	14.46	Valid
	X.3.6	0.89	15.27	Valid
	X.3.7	0.88	15.13	Valid
	X.3.8	0.86	14.88	Valid

Furthermore, the suitability test of the discriminant validity measurement model and the reliability test were determined based on the Variance Extracted (VE) and Construct Reliability (CR) values. If the value of VE is 0.5 then the variable is declared valid and if CR is 0.7 then the variable is declared reliable. Based on the results of manual calculations of CR and VE values as shown in Table 4, it was found that all indicators had VE and CR values of 0.5 and 0.7 respectively, which means that the questions and dimensions used in this study were valid and reliable. Therefore, it can be concluded that the questions on each of the indicators used in this study are sufficiently measurable and reliable.

Table 4. Variance Extracted (VE)

Latent Variable	VE	CR
Digital Transformation (X1)	0.75	0.99
Organizational Strategy and Governance (X1.1)	0.78	0.93
Curriculum and presentation method (X1.2)	0.71	0.96
Assessment (X1.3)	0.72	0.93
Staff support and development (X1.4)	0.81	0.94
Infrastructure and resources (X1.5)	0.75	0.95
Leadership Capabilities (X2)	0.72	0.96
Organizational Resilience (Y)	0.76	0.96

Hypothesis testing through path coefficient testing on the structural equation model. If the value of t-value > 1.96 or t-value < -1.96 then the influence of certain variables is included in the significant category. Based on the empirical model proposed in this study, it is possible to test the hypothesis by testing the path coefficient on the structural equation model. If the value of t-value > 1.96 or t-value < -1.96, the influence of certain variables is then categorized in the significant category. The test results show that the digital transformation latent variable (X_1) had a t-value value of 3.82. This value was greater than 1.96 which indicated that there was a positive and significant effect between digital transformation (X_1) and organizational resilience (Y). Likewise, the latent variable of leadership ability (X_2) had a t-value value of 6.57. This value was greater than 1.96 which indicated that there was a positive and significant influence between leadership ability (X_2) and organizational resilience (Y).

Table 5. Result of SEM Model Estimation

Variable Impacts	Coefficient Path	t-value	Significance	Status
H1: Digital Transformation (X1) ♋ Organizational Resilience (Y)	0.09	3.82	Significant	H1 Accepted
H2: Leadership Ability (X2) ♋ Organizational Resilience (Y)	0.40	6.57	Significant	H2 Accepted

DISCUSSIONS AND CONCLUSION

In nutshell, based on the results of the research, it is shown that digital transformation variables and leadership abilities had a significant and positive effect on organizational resilience at Universitas Terbuka. It can also be seen that the variable of leadership capability provided the highest significance.

The coefficient path of digital transformation and organizational resilience was 0.09 with a t-value of 3.82. It means that the digital transformation variable had a positive and significant effect on organizational resilience. Thus, this study supports the first hypothesis which states that digital transformation has a significant impact on organizational resilience. This result is in line with the research conducted by Zhang et al., (2021) which stated that digital transformation can increase an innovation capability which in turn can

increase organizational resilience. This is also aligned with research from Bustinza et al., (2019) which states that through the qualitative comparison and analysis of fuzzy sets. It is also found that digital transformation is a significant antecedent condition of two high organizational resilience configurations which further explains that implementing digital transformation has a significant guarantee for organizations to achieve high organizational resilience.

Digital transformation is the process of using technology to transform the way a company operates and significantly increase the value of the company. Three essential leadership qualities—mindset, skill, and toolset (equipment/technology)—must be combined for the digital transformation to be implemented successfully.

Mindset;

- Adopt a digital mentality: Organizations should cultivate a mindset that is receptive to change and innovation. They must realize the importance of digital transformation and recognize that technological change is an essential component of organizational development.
- Customer orientation: Organizations should prioritize their customers. They must understand their consumers' requirements and preferences and leverage digital technologies to create a better experience and enhance customer engagement.
- Culture of innovation: Organizations should foster an environment that encourages experimentation, new ideas, and continual learning. They must minimize employees' fear of failure and encourage them to share innovative ideas.

Skillset;

- Technology skills: Organizations should ensure that employees have the necessary skills to adopt and manage digital technologies. This includes an understanding of relevant technologies and the ability to use digital tools effectively.
- Analytical capabilities: Data and analytics play a critical role in digital transformation. Employees need to have analytical skills to collect, analyze, and understand data to make data-supported decisions.
- Collaboration skills: good collaboration and communication skills are essential in a work environment powered by digital technologies. Employees must be able to collaborate effectively with other team members and departments, using digital collaboration tools.

Toolset ;

- Technology infrastructure: Organizations must have a strong technology infrastructure to support digital transformation. This includes a fast and reliable network, necessary hardware and relevant software.
- Digital tools: Organizations need to adopt and integrate relevant digital tools to support operations and innovation. For example, project management tools, collaboration platforms, data analytics, artificial intelligence and internal communication platforms.

Meanwhile, the coefficient path of the digital transformation and organizational resilience was 0.40 with a t-value of 6.57. It can be explained that the variable of leadership ability had a positive and significant impact on organizational resilience. Thus, this study supports the second hypothesis which states that leadership ability has a significant impact on organizational resilience. These results are in line with previous research by (Lengnick-Hall et al., 2011) and Lisdiono et al., (2022). It can be seen that based on the structural equation modeling analysis and based on the findings, leadership capabilities play a role in developing resilience. Leadership is the executive power that enables an organization to be resilient. The result indicated that a good professional leader with strong and complete capabilities enabled an organization to navigate prudently and triumphantly to the ultimate objective of organization.

Organizational leaders play a key role in facilitating the successful implementation of digital transformation and strengthening organizational resilience. Some actions that leaders can do include:

1. Leadership oriented towards long-term thinking: Leaders must have foresight and encourage organizations to think strategically about technological developments and how they will affect business in the future.

2. Supporting cultural change: Leaders must play a role in building an organizational culture that is innovative, adaptive, and open to change. They must communicate the values and beliefs that support digital transformation, and encourage the active participation of all members of the organization.
3. Drive learning and development: Leaders must facilitate employee learning and development in the context of digital transformation. They can provide training, workshops, and relevant resources to enhance employees' digital understanding and skills.
4. Build a diverse team: Leaders should ensure that teams involved in digital transformation have diverse expertise and a holistic understanding of technology, business and customers. This will assist organizations in dealing with complex challenges and building innovative solutions.
5. Measuring and managing performance: Leaders should establish relevant performance indicators to measure the progress of digital transformation and manage the change. This can involve monitoring the rate of technology adoption, customer satisfaction, increased operational efficiency, and the resulting business results.
6. Communicate effectively: Leaders must be effective communicators and be able to articulate the vision, strategy and benefits of digital transformation to all stakeholders. They must inspire, motivate and engage team members on the digital transformation journey.
7. Flexibility and adaptability: Leaders need to be able to deal with change and overcome obstacles that may arise during digital transformation. They must be able to adapt quickly, change direction when necessary, and drive continuous innovation.

By combining a positive mindset, relevant content, and effective digital tools, as well as strong leadership, organizations can improve their resilience to the challenges of transformation and disruption brought on by the digital era. Data research revealed that digital transformation and leadership have a favorable and significant impact on organizational resilience. This suggests that the greater the digital transformation of Universitas Terbuka, the better the resilience of Universitas Terbuka. In line with this, the greater the leadership demonstrated by university officials, the more resilient the of Universitas Terbuka will be. By knowing the effect of digital transformation and leadership on organizational resilience, Universitas Terbuka will continue to strive to improve digital transformation and also leadership to ensure that the organization can survive, under any conditions, including the political crisis or economic recession due to COVID-19.

On the other hand, this research still focuses on student responses regarding the influence of digital transformation and leadership on organizational resilience. In the future, research can be developed by involving respondents from other parties, such as campus staff and parents. In the final section, it can compare the similarity of responses from the three groups regarding organizational resilience in Universitas Terbuka. In addition, it is necessary to conduct research related to the influence of digital transformation leadership on organizational performance. This is necessary in order to see the relationship between leadership style in the context of digital transformation and its impact on organizational performance. This study can identify the most effective leadership characteristics in directing digital transformation and determine the extent to which leadership contributes to the resulting business results. With more research in this area, we may gain a deeper understanding of the leadership role in digital transformation and build better strategies to drive effective and sustainable digital transformation.

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THE EFFECTS OF GROUP-BASED PERSONALIZED ONLINE TEACHING ON LEARNERS' COMMUNITY OF INQUIRY AND ACHIEVEMENT OF A COURSE

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Received: 07/06/2023 **Accepted**: 14/09/2023

ABSTRACT

The aim is to investigate the effects of delivering group-based personalized teaching via an electronic performance support system (EPSS) in an online medical informatics course on medical students' academic achievement and community of inquiry levels. The basic working principle of EPSS is to provide the most appropriate teaching methods to the educator, according to the students' variables and learning outcomes. The research design of this study involved a quasi-experimental pretest-posttest design with a control group and the qualitative research method of answers to follow-up questions. While the students in the experimental group were taught various teaching approaches (flipped classroom, brain storming, case-based learning, debate and think-pair-share), the students in the control group were taught directly by online lessons according to direct instruction method. It was seen that the experimental procedure had a positive effect on both the academic achievement and community of inquiry levels of the experimental group compared to the control group. Besides, students in the experimental group reported that the lessons were more effective when they were enjoyable, motivating, focused on discussion and research, and were taught through cases. The group personalized teaching method used in this study could be a guide for future studies.

Keywords: Online learning, improving classroom teaching, learning communities, teaching strategies.

INTRODUCTION

One of the situations that education should deal with is mostly that a uniform education has been given to students, although they are completely different from each other (preliminary knowledge, needs, interests, etc.). From a historical point of view, two main approaches have been used in solving this fundamental problem: (1) creating homogeneous classes by selecting students (grouping, monitoring, identifying, etc.), and (2) creating heterogeneous classes with different students without any selection, and then arranging the teaching environment/resources according to the various characteristics of the individuals (Bernacki et al., 2021). The first approach is very difficult to implement, as student profiles/variables are very diverse and constantly changing. The second option, "personalization", has become one of the main goals for educators with technology accompanied by integration of computer/data and learning sciences (Basham et al., 2016).

The concept of personalized education, which emerged for the first time in the laboratory school project by Dewey in 1896, was defined as a situation in which the learning environment (presentation, exam, course material, teaching method, etc.) is arranged in line with students' personal information (individual characteristics, interests, needs, etc.) (Xie et al., 2019). Although the concepts of "personalized teaching" and "adaptive teaching" are different from each other in the literature, they are often seen to be used interchangeably (Li et al., 2021). In adaptive learning, teaching activities can be applied according to the academic performance of the students without defining any personal characteristics/preferences. However, in personalized teaching, teaching is performed according to the individual characteristics, without any adaptation regarding the on-going progress of individuals in a task or situation.

It is observed that personalized education has a positive effect on many variables in every field of study, when the research studies in the literature are examined in general. Systematic review studies revealed that personalized education was effective on the variables of performance, perception, satisfaction, engagement, motivation, enjoyment, attendance and interest (Bernacki et al., 2021). However, it has been reported that most of these studies were carried out in short intervention periods and generally provided high-level technology-enhanced personalized education. The development of technology and accompanying technology-enhanced teaching can facilitate personalized teaching (Hernandez-Cardenas et al., 2022; Lim et al., 2020). Recently, data on individuals have been collected with learning analytics, artificial intelligence (AI), virtual reality and wearable technologies, and fully-personalized teaching situations are designed according to these data (Hernandez Cardenas et al., 2022; Lim et al., 2020). However, these situations bring about very complicated processes and are difficult to implement. Basically, it was reported that the hardest of these implementation difficulties are the existence of multivariate student profiles and the cost/workforce (Tan, 2021). We carried out this study with the idea of providing optimal group-based personalization, in order to reduce the limitation of this situation.

As e-learning environments, especially synchronous teaching, have been more extensively used during and after the Covid-19, it has been seen that these learning environments were uniform and educator centered, as in traditional teaching environments (Turnbull et al., 2021). The realization of effective learning in online environments is closely related to the community of inquiry (CoI) of the learners (Lee et al., 2021; Mr, 2021). In this context, "the model of community of inquiry" is an effective model that guides e-learning environments in order to create collaborative and constructivist deep content with online presence elements (Garrison et al., 1999). It has been reported that more successful learning and performances were realized in online learning environments where various student-centered approaches were used (Lee et al., 2021). Educators need to be supported to enable the use of these various teaching activities on the basis of personalized teaching. In this respect, EPSSs have the potential to provide instant support to educators on duty (Cakir & Tuzun, 2003). In this study, EPSS with a database of various educational activities was further developed, and its effects on providing personalized teaching in the online environment were evaluated.

BACKGROUND

Electronic Performance Support System

EPSS is defined as "integrated electronic environments to provide instant and easy information, suggestions and experience for individuals in order to increase their performance" (Sezer, 2021). The most important features of these systems are that they can be used during the education process and in education environment and that they present appropriate information clearly (Ugur-Erdogmus & Cagiltay, 2019). Basically, there are four components that should be included in an EPSS. These are databases, teaching systems, consultant systems and auxiliary tools (McKay & Wager, 2007). These systems, which are generally developed as mid-level (Sezer, 2021) and high-level (Lizdas et al., 2017) according to the level of complexity (programming, AI integration, etc.), have been seen that they are very effective in gaining knowledge/skills.

EPSS has been developed and used for many educational design processes and for educational designers. Many systems, the first example of which is GAIDA developed in 1994, have been very effective for the automation of educational design and material development (Askar, 2018; Wang et al., 2007; Ugur-Erdogmus & Cagiltay, 2019). The basis of this success is the amount, type, timing and presentation of the needed information to individuals in the right environment. However, performance in these studies is generally focused on a single product (lesson plan, course material, etc.). In this study, we rather focused on the teaching process and tried to provide a group personalized teaching environment. The most important advantages of the EPSS developed in this research are the following; it is prepared in a short time at low cost, does not require high technology skills for use, provides pedagogical support to educators about educational activities and has the potential to be used for a wide audience.

Community of Inquiry Framework

The model was developed to support higher education and was comprised of three elements. These elements are *social, cognitive and teaching presence* (Garrison et al., 1999). Evaluation of the effectiveness of the developed e-learning systems is suggested to be made according to this model (Almasi & Chang, 2020; Horzum, 2015; Karaoglan-Yilmaz, 2020; Tan, 2021). The research conducted by Korkmaz and Toraman (2020) with 1016 educators during the COVID-19 period reported that effective teaching could not be realized due to problems like the technology literacy level of the educators, the interaction problem in online environments, low motivation of the students, monotonous lecturing etc. Similarly, it was determined that students did not attend courses, their cognitive/teaching/social presence levels decreased in synchronous courses and engagement of students was not fully achieved during and after the COVID-19 period (Almasi & Chang, 2020; Chung et al., 2020). In this direction, it is recommended to provide the most basic level of faculty development programs, educator training and material/method diversity (Amir et al., 2020; Tan, 2021). In e-learning environments, it is argued that it is important to create situations enabling student-student and student-educator interaction, problem-based discussion activities and opportunities for students to cooperate (Almasi & Chang, 2020; Lee et al., 2021; Tan, 2021).

Rational and Research Hypotheses

This study aimed to use the teaching methods that are most suitable for the students' individual characteristics, especially in online education, based on the requirements mentioned above. Since there are individual differences among students, the determination of the most basic variables that should be addressed in personalized education with educational science experts was the first step. In this way, the use of the most appropriate educational methods for the student community consisting of a heterogeneous group was discussed which would create a more effective and efficient group personalized teaching situation. An EPSS designed by the author (Sezer & Simsek, 2018), which can be used by educators to provide effective educational environments, was implemented and evaluated for the first time during an academic term within the scope of medical informatics course. This study is a first for the use EPSS, which has a wide range of applications, to support personalized teaching.

In this study, it was aimed to investigate the effects of delivering group-based personalized teaching via an electronic performance support system (EPSS) in an online medical informatics course on medical students' academic achievement and community of inquiry levels. In this context, the following hypotheses were formed:

Hypothesis 1. (H1): Academic achievement scores of the students in the intervention group who applied personalized teaching will be higher than the control group.

Hypothesis 2. (H2): Community of inquiry levels of the students in the intervention group who applied personalized teaching will be higher than the control group.

METHOD

The research design of this study involves a quasi-experimental pre-test-posttest design with a control group and the qualitative research method of answers to follow-up questions. The effect of personalized education on students' academic success and CoI levels were investigated in this study. Personalized teaching methods with online synchronous EPSS support were applied to the experimental group, while synchronously online teaching with the traditional lecture method was used in the control group.

Participants

The study group consisted of 120 (male= 54, female= 66) second-year students studying in two different fields in Hacettepe University Faculty of Medicine and taking the "Medical Informatics" course. The difference between academic achievement and CoI pre-test scores of both groups was not statistically significant (p>.05). This showed that both groups were equivalent in terms of CoI levels and academic achievement before the experiment (see Table 1). Accordingly, the study was carried out by the same educator in two groups. Both the experimental group (female= 34, male= 26) and control group (female= 32, male= 28) consisted of 60 students. All participants gave their written and verbal informed consent.

Structure and Algorithm of the System

The system was designed by five educational technology specialists (faculty members), and the validation of these processes was provided by the opinions and suggestions of 16 faculty members at the national level. There are 44 educational activities (methods, techniques, approaches, etc.) in the database of this EPSS, which was previously designed by the author (Sezer & Simsek, 2018) and further developed for the first time in the present study. The basic operation of the system relies on the variables of learning outcomes (Bloom's taxonomy) (Krathwohl, 2002), and student variables that affect the "achievement", "participation", and "performance" of the students. In this context, "technology self-efficacy, academic self-efficacy, course-related task value, and prior knowledge" determined students' variables by the experts.

To prepare the database related to the educational activities, first, the variables that affect the "achievement", "participation" and "performance" of the students were determined. With the consensus of the experts, "online technology self-efficacy, academic self-efficacy, course-related task value, and prior knowledge" variables were included in the system's structure. Secondly, the definition and stages of 44 selected activities (flipped classroom, brain storming, anchored learning, spaced learning, etc.) in the database were prepared. Then, to prepare "matching algorithm", the suitability levels of 44 activity-student variables were also rated by experts via 5 (highly suitable) to 1 (not suitable at all) (see Figure 1). More detailed information on these stages can be found in the author's previous study (Sezer & Simsek, 2018).

	Accelerated Learning	Anchored Learning	Authentic Project	Best Choice Debate	Buddy System	Book Report	Brainstorming
2. Student Variables							
2.1. Self-efficacy regarding course							
Low	4	1	1	1	4	1	1
High	5	5	5	5	5	5	5

Figure 1. Sample figure for student variable–activity (self-efficacy regarding the course) suitability

An example of the developed system is shown in Figure 2; after 'Low-Medium-High' selections are made according to the results of the student variables, the educational outcomes of the relevant course are marked according to Bloom's taxonomy, and the most appropriate activities for the related group are listed with the 'FIND' button. The educator can access basic information about these activities (and more detailed information/examples, if preferred) step-by-step by choosing the desired activity/activities.

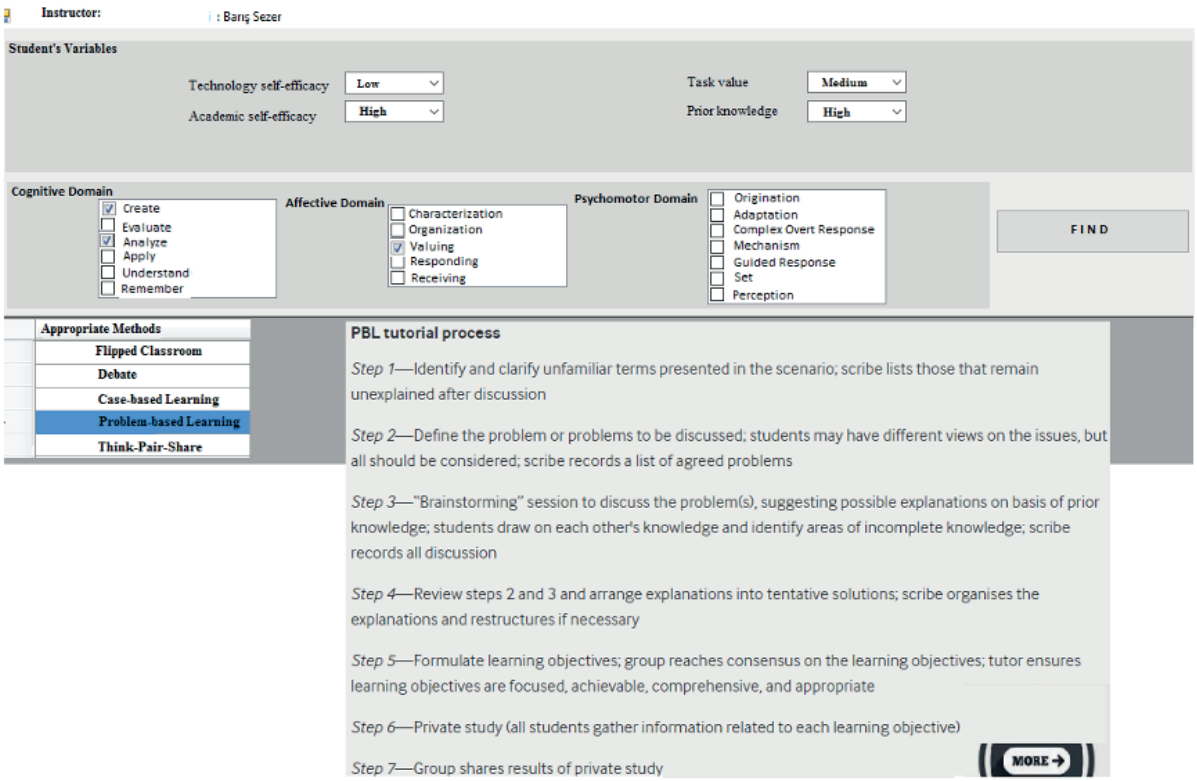

Figure 2. Sample figure of the developed EPSS

In line with the data obtained from the measurement tools, the system suggested 'flipped classroom, brain storming, case-based learning, debate and think-pair-share' activities based on the scores of the experimental group students on "online technology self-efficacy, academic self-efficacy, task value for the course, prior knowledge" scores (the scores obtained from the scales/tests reported in the data collection tools section were entered into the system as input, therefore detailed information on these values were not given in the findings section) and lecture outcomes that could change every week. The lessons were carried out synchronously over Zoom by using these teaching activities according to the weekly lecture (12 weeks in total) outcomes with the experimental group during an academic term, within the scope of the study. On the other hand, the lessons (12 weeks in total) were carried out synchronously over Zoom based on the direct instruction method with the control group.

Data Collection Tools

Online Technologies Self-efficacy Perception Scale

This scale was developed by Miltiadou and Yu (2000) and was adapted to Turkish in 2009 (Horzum and Cakir, 2009). The scale consisted of 29 items (lowest score= 29, highest score= 116) and four sub-scales (Asynchronous interaction I, Asynchronous interaction II, Synchronous interaction and Internet competencies). Evaluations related to the scale were coded as "Low-Medium-High" in order to define "online technology self-efficacy" scores in EPSS, only for the experimental group students.

Task Value for the Course

"The Motivated Strategies for Learning Questionnaire (MSLQ)" developed by Pintrich et al. (1993) was used for task value. The motivation section of MSLQ consists of 6 sub-dimensions: "self-efficacy, test anxiety, intrinsic goal orientation, extrinsic goal orientation, control belief, and task value". Pintrich et al. (1993) stated that the scale could be used in different disciplines and all or individual dimensions of the scale could be included, depending on the purpose of the research. Adaptation of the scale to Turkish was done by

Buyukozturk et al. (2004). The 6-item "task value" sub-dimension (lowest score= 6, highest score= 42) in the motivation section of the related scale was used within the scope of this research. Evaluations related to the scale were coded as "Low-Medium-High" in order to define "task value" scores in EPSS, only for the experimental group students.

Academic Self-efficacy Scale

The scale was developed by Jerusalem and Schwarzer (1992) and was adapted to Turkish in 2007 (Yilmaz, Gurcay and Ekici, 2007). The scale, which has a one-dimensional structure, consists of a total of 7 items (lowest score= 7, highest score= 28). Evaluations related to the scale were coded as "Low-Medium-High" in order to define "academic self-efficacy" scores in EPSS, only for the experimental group students.

Community of Inquiry Scale (CoIS)

This scale was developed by Arbaugh et al. (2008) and adapted to Turkish in 2012 (Ozturk, 2012). The scale was used in the present study to determine students' community of inquiry levels. The scale consists of 34 items (lowest score= 34, highest score= 136) and three sub-scales in total. The high score obtained indicated higher level of community of inquiry of the students.

Academic Achievement Test

The test, consisting of 20 questions, was developed by the author. There are various question forms in this test, and the maximum total score that can be taken is 100. A specification table was prepared and used to ensure scope validity during the validation process. In addition, for validity and reliability of the test, evaluation criteria were developed, and the opinions of field experts and second-year students were taken before administering the test. Before the experimental procedure, this test was applied to 20 second-year students who were not included in the study group. To determine the reliability of the test, Kuder-Richardson Formula 20 (KR-20) was applied and 0.88 was obtained in the pre-test and 0.87 in the post-test.

Feedback Form

Feedback form, which was developed by the author to facilitate the interpretation of the qualitative data, consists of three questions. The interview with the students were held online, and one week after course program.

Data Analysis

The data were analyzed with descriptive statistical techniques, chi-square and t-test. Cohen's d effect size was calculated if there was a significant difference in the performed t-test. As a general recommendation for the effect size, Cohen states that if the d value is less than 0.2, the effect size can be defined as weak, if it is between 0.5-0.8 the effect size is medium, and if it is greater than 0.8 the effect size can be defined as strong (Cohen, 1988). Qualitative data obtained from the feedback form were analyzed by two educators and was coded under three themes, using content analysis.

FINDINGS

The study involved 120 voluntary students. The experimental and control groups did not differ according to age, gender, academic achievement and CoI levels before the experimental procedure (see Table 1). The introductory information of the students in the study group is given in Table 1.

Table 1. Demographic characteristics of participants

		Experimental (n= 60)	Control (n= 60)	Test statistics p value
Gender	Female Male	34 (51.5) 26 (48.1)	32 (48.5) 28 (51.9)	x2: .135 p: .714*
Age	Mean	19.13± 0.91	19.31±.89	t: -1.114 p: .268**
Academic Achievement	Mean	41.65± 9.45	42.95±9.01	t: -.771 p: .442**
CoI	Mean	67.95± 11,56	68.88±11.91	t: -.435 p: .664**

*Chi-square test, ** The independent sample t test

In order to test the hypotheses of the present study, pretest and posttest mean scores were compared between groups (experimental and control), t-test was used in independent samples and intergroup comparisons in paired samples. The results of the analyses are given in Table 2.

Table 2. Distribution of pre-test and post-test values of measurement tools with respect to experimental and control groups

		Experimental	Control	
		Mean± SD	Mean± SD	Test statistics p value*
CoI	Pre-test	67.95± 11.56	68.88± 11.91	t: -.435 p: 0.664
	Post-test	96.23± 15.74	76.06± 17.84	t: 6.564 p: 0.00
	Test statistics p value**	t: -11.401 p: 0.00	t: -2.533 p: 0.14	
Academic achievement	Pre-test	41.65± 9.45	42.95± 9.01	t: -771 p: 0.442
	Post-test	86.31± 9.22	75.41± 17.76	t: 4.219 p: 0.00
	Test statistics p value**	t: -23.977 p: .000	t: -13.737 p: .000	

*Independent sample t test, **paired sample t test

While the CoI pre-test post-test measurements of the experimental group (t:-11.401; p=0.00) showed a statistically significant difference, the control group (t:-2.533; p=0.14) did not show a statistically significant difference. A statistically significant difference was found between the post-test measurements regarding the CoI levels of the experimental and control groups (t: 6.564; p=0.00). In the effect size analysis of the resulting difference, Cohen's d value was determined as 0.51 and it was found to have a moderate effect.

A statistically significant difference was found between the academic achievement pre-test post-test measurements of the experimental group (t:-23.977; p=0.00) and the pretest-posttest measurements of the control group (t:-13.737; p=0.00). A statistically significant difference was also found between the post-test

measurements of the experimental and control groups in terms of academic achievement variable (t: 4.219; p=0.00). In the effect size analysis of the resulting difference, Cohen's d value was determined to be 0.77 and indicated a medium-high level effect.

A focus group interview was conducted with 54 students (6 students did not participate) in the experimental group, in order to get the opinions on the personalized teaching. The interview was held in a one round in the classroom during the last course hour. In this interview, a discussion was conducted with the students using the brainstorming technique regarding the personalized teaching method by the educator, and at the end of this discussion, the feedback form was distributed to the students. Data collected from 54 students were subjected to content analysis. The meaningful data were determined, coded by two educators and the draft themes were identified. The codes obtained according to these draft themes were rearranged and clarified. The findings obtained as a result of the content analysis are given in Table 3.

Table 3. Thematic codes

Category	Code	f
Positive aspect	Interaction in course	36
	Different education methods	33
	Having fun in course	27
	Motivating	23
	The need for face-to-face education	16
Negative aspect	Spending much time preparing before course	13
	Technical issues	5
Things to be Improved	Effective learning management system	12
	Artificial intelligence integration	9
	Integration with other courses	8

As could be observed from Table 3, most of the students were satisfied with personalized education. Students reported the positive aspects as, generally taking a more active role in synchronous lessons, coming to the lessons more motivated, use of various educational activities and case-based situations were more contributive. Sample student statements expressing this feeling are as follows:

> *Although our group wasn't small, we organized interactive Zoom sessions with both my friends and our educator. This way, I could actively participate in the lessons without being passive.*

> *While it wasn't quite the same as face to face education, the lessons were highly interactive. I completed this course with minimal boredom since various educational methods (problem-case based) were employed.*

> *Our educator frequently engaged us using various educational applications on our mobile devices. Consequently, I can confidently say that our motivation increased.*

On the other hand, as the negative aspects, students reported that they would like to take this course face-to-face, in which case much more effective learning would have taken place. They reported the reasons for this situation as especially the technical problems experienced from time to time and stated that they had to be exposed to the screen a long time. Sample student statements expressing this feeling are as follows:

> *Due to the demanding nature of the medical education program, we often found ourselves dedicating substantial time to course preparations outside of class. While it was informative, it posed time-related challenges.*

Zoom sessions were occasionally interrupted, and I encountered sound issues at times. I suspect these issues were related to my internet connection speed.

Since I was attending the lessons on my mobile phone, I faced difficulties in simultaneously keeping up with the lectures and actively participating in the educational activities within the applications.

In the aspects that need to be developed, the students have requested that the variety of methods covered in this course should also be applied in other courses. In addition, students also expressed their requests to use artificial intelligence supported learning management system. It has been reported that this artificial intelligence support (adapted interface/exam/content) will make LMS more personalized. Sample student statements expressing this feeling are as follows:

The materials shared on the LMS for pre-class could have been more personalized. For instance, I would have preferred shorter videos. I also wish the LMS had personalized editing capability like this.

Interactive Zoom sessions should be a part of certain courses without a doubt, as they prevent boredom.

I already had prior knowledge of certain content, such as virtual patients. In such cases, higher-level materials could have been presented to me using a system like artificial intelligence.

DISCUSSION AND CONCLUSION

In this study, the effect of group personalized teaching provided by EPSS on the academic success and CoI levels of second-year students was investigated, and it was determined that personalized instruction applied to the experimental group had a positive and significant effect on both the academic achievement and community of inquiry levels of the students compared to the control group. Accordingly, the hypotheses of the research, H1 and H2, were accepted.

In the literature, it is observed that individually personalized instruction is usually carried out in small groups; however, computer-based adaptation/personalization studies are carried out in larger groups with the development of technology. In this study, optimal educational activities suitable for the group profile and course outcomes were used in order to provide group personalized teaching. There are many studies on the use of EPSS positively affects students' learning and performance (Martinez-Mediano & Losada, 2017; Mitchell, 2014; Sezer, 2021). This study, in which EPSS was used to support personalized teaching, is a first and sets an example for the variety of uses of EPSS.

Another positive situation experienced in the present study, was that the perception of presence in online environments, which was the main measured subject within the framework of CoI, was at a high level. Studies have revealed that students' CoI levels are highly correlated with their academic self-efficacy and course motivation (Shea & Bidjerano, 2010; Karaoglan-Yilmaz, 2020). It is suggested that the three components of CoI, cognitive, social and teaching presence, should be highly interrelated to each other, and a balanced online education should be designed by integrating these three components (Caskurlu et al., 2021). It is thought that the positive findings obtained in the present study are the result of using constructivist teaching approaches (problem-based learning, reflection, collaborative tasks, interactive lectures, discussion, etc.). It was reported that these teaching activities increase students' community of inquiry levels. (Horzum, 2015; Karaoglan-Yilmaz, 2020). These findings also reveal the necessity of using innovative educational techniques/applications, either online or offline, in which students are more active, instead of the traditional direct instruction method, in the 21st century.

Limitations

Only course outcomes and student variables were discussed in this study. Stronger personalization could be achieved by considering educator and learning environment variables.

Conclusion

In this study, the personalization part of a pre-designed EPSS was developed to provide personalized education and used in the online medical informatics course of students. The courses taught according to the educational methods/activities increased students' academic success in the medical informatics course and had a positive effect on their CoI levels. The group personalized teaching method used in this study could be a guide for future studies.

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GRIT, RETENTION AND STUDENT SUCCESS IN A SOUTH AFRICAN DISTANCE EDUCATION INSTITUTION: A POSTGRADUATE TRIAD?

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Received: 22/06/2023 **Accepted:** 23/08/2023

ABSTRACT

Psychological grit has gained substantial interest among traditional higher education practitioners, with many seeking the link between grit, academic performance and retention. The literature pertaining to distance education cohorts is scant, however, especially within the South African context, which holds unique challenges for accessing and completing a tertiary qualification. This study made use of a non-experimental design and used Grit-S and demographic data combined with records of student performance and progression to ascertain grit's role in determining retention and degree completion at a mega distance education institution in South Africa. The sample comprised 775 honours students who registered for their qualification for the first time in 2017. Results from the final structural model highlighted the significant influence of perseverance and first-to-second year retention on student success (operationalised at qualification completion). A subsequent binary logistic regression revealed odds ratios of 1.98 (CI: 1.45 – 2.69) and 12.15 (CI: 7.40 - 19.95), respectively. The final model explained 24% of the variance in qualification completion rates, with the biggest contributor being first-to-second year retention (β = .45; p < .01). These results and subsequent implications are discussed.

Keywords: Psychological grit, student success, retention, postgraduate, distance education, South Africa.

INTRODUCTION

Degree completion rates (or throughput rates) have remained chronically low in many South African institutions, but particularly among those embracing distance education (DE) as their primary mode of delivery. As the leader of open distance e-learning (ODeL) on the African continent with over 94% of all DE students in the country (ca. 363 000 students), the University of South Africa (UNISA) is particularly prone to this tertiary endemic (Department of Higher Education and Training, 2023b). According to the most recent throughput statistics available, the national dropout rate among DE cohorts in the first year of study ranged from as high as 56.8% in 2000 to 24.9% in 2020 (Department of Higher Education and Training, 2023a, p. 20). What's worse, the year-on-year retention rates taper off each year, with resulting throughput rates standing between 11.6% (2000 cohort) and 30.0% (2012 cohort) after 10 years (Table 1; Department of Higher Education and Training, 2023a). Despite the consistent improvement evident in first-year attrition rates, the 2020 cohort still lost a quarter of its students to dropout. This loss represents not only an inefficient use of funding in DE, but also the cost of time, energy, effort and finances to the student. Before proceeding, however, we would like to acknowledge that dropout is a multifaceted, complex concept

with varying definitions (Bagriacik Yilmaz & Karatas, 2022; Elibol & Bozkurt, 2023). In this paper, the conceptualisation of dropout used by the institution under study is one where a student registered for formal studies does not return to studies in subsequent years.

Table 1. National throughput rates for all undergraduate qualifications in distance education (Department of Higher Education and Training, 2023a, p. 21)

Intake year	Graduates (%): Distance mode							
Year 1	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
2000	3.2	5.4	7.4	8.6	9.4	10.2	11.0	11.6
2001	3.2	5.2	7.0	8.3	9.2	10.1	11.1	12.0
2002	9.0	11.0	12.7	13.9	14.9	15.9	16.8	17.6
2003	4.3	6.1	7.8	9.4	10.7	11.9	13.1	14.1
2004	4.1	6.3	8.3	10.0	11.6	12.9	14.0	15.3
2005	1.8	3.9	6.3	8.5	10.3	11.8	13.4	14.8
2006	1.9	4.2	6.6	8.7	10.5	12.2	14.0	15.4
2007	2.7	5.6	8.4	10.9	13.6	15.9	17.9	19.4
2008	1.7	4.7	7.7	11.3	14.4	16.9	18.9	20.3
2009	2.1	6.3	11.4	16.3	20.2	23.2	25.1	26.7
2010	2.3	6.8	12.8	18.5	22.6	25.4	27.3	28.8
2011	2.2	6.9	13.6	19.7	23.5	26.1	27.8	29.5
2012	1.5	5.4	13.0	19.1	23.3	25.8	28.3	30.0
2013	1.8	8.3	16.5	22.9	26.6	29.7	31.6	
2014	3.2	10.8	20.9	27.8	33.1	36.2		
2015	2.2	9.6	20.6	28.4	32.9			
2016	4.1	14.1	25.8	32.8				
2017	2.9	14.0	25.2					
2018	3.0	14.1						
2019	3.6							

Throughput Rates among Postgraduate Honours Cohorts

While a great deal has been done within the undergraduate arena, those studies which concern themselves with the success and retention of postgraduate honours students in South Africa are scant (Mouton et al., 2015). Seeking to narrow the gap almost a decade ago, Mouton et al. (2015) examined the 2001 and 2008 entering honours cohorts (N = 17 773 and N = 26 148, respectively) in South African public higher education institutions (HEIs) over a period of years. Their results revealed that 66.3% of the 2001 cohort and 65.5% of the 2008 cohort had graduated within five years, with yearly marginal increases thereafter (i.e. by less than 1% per year). Despite not being able to locate UNISA's honours students in the study by Mouton et al. (2015), the study provides useful insight into the retention and throughput of honours students in South Africa

UNISA's Honours Cohorts

Among UNISA students specifically, a report compiled by UNISA's Directorate for Institutional Research (2015) showed that the honours cohorts in the university exhibited poorer retention and graduation rates when compared to the undergraduate and other postgraduate clusters. Using aggregated data captured over

a period of ten years, analysis revealed year-on-year increases in the throughput rates for all qualification clusters with the exception of the honours cohorts (Directorate for Institutional Research, 2015). The completion rates among the honours cohorts dropped from 25.1% in 2011 to 24.8% in 2012, and then to 24.7% in 2013. Although considered a relatively small decrease, it should be noted that the data represents a 10-year trend of all entering honours cohorts. As such, the importance of these results lies in the observed trend over time, which indicates that, on average, less than a quarter of the honours cohorts at UNISA persist to the point of completion, with these figures demonstrating unfavourable trajectories for the future.

The Role Played by the Postgraduate Honours Qualification

The South African higher education (HE) system is structured according to the Higher Education Qualifications Subframework (HEQSF), which outlines National Qualifications Framework (NQF) levels that specify the outcomes of each level (Department of Higher Education and Training, 2014). The levels range from 1 (i.e. a General Education Certificate) to 10 (i.e. a doctoral degree), with honours qualifications classified at NQF level 8. At this level, honours qualifications play a crucial role in preparing students for careers that specialise in higher order, strategic and critical thinking skills. It also forms part of the pipeline into master's education. In particular …

> *…the Bachelor Honours Degree is a postgraduate specialisation qualification, characterised by the fact that it prepares students for research-based postgraduate study. This qualification typically follows a Bachelor's Degree and serves to consolidate and deepen the student's expertise in a particular discipline, and to develop research capacity in the methodology and techniques of that discipline. This qualification demands a high level of theoretical engagement and intellectual independence* (Department of Higher Education and Training, 2014, p. 34).

Despite their importance, honours cohorts have received (and continue to receive) relatively less attention from educationists and researchers compared to undergraduate cohorts (Mouton et al., 2015). With this in mind and given their importance in the South African HE value-chain as well as the size of the institution under study, it is crucial to understand what factors, if any, play a role in improving the retention and throughput rates among honours cohorts.

PSYCHOLOGICAL GRIT

Cognitive ability as a key determinant in academic success is well established, even in DE. However, there has been a recent shift in success research and positive psychology toward the examination of the role of socio-emotional skills or non-cognitive skills with an emphasis on mindset, personal traits, goal orientation and self-efficacy (Danner, Lechner & Rammstedt, 2020; Kaya & Yuksel, 2022; Mohan & Kaur, 2021). While relatively young as a field of study, psychological grit has emerged as one of the key factors in this area of research (Kaya & Yuksel, 2022).

Defined as passion and perseverance towards long-term goals (Duckworth, Peterson, Matthews & Kelly, 2007), grit has received global attention over the last 15 years and has emerged as a key factor in predicting student retention and success in tertiary settings (Akos & Kretchmar, 2017; Bowman, Miller, Woosley, Maxwell & Kolze, 2019; Datu, Valdez & King, 2016; Farruggia, Han, Watson, Moss & Bottoms, 2018; Mason, 2018; Saunders-Scott, Braley & Stennes-Spidahl, 2018). While significant strides have been made in this regard, the findings on grit often relate to traditional student populations (i.e. contact-based), or high-achieving, privileged student populations. And although studied within the confines of DE (Cross, 2014; Hwang, Lim & Ha, 2017; Wang & Baker, 2018), these studies have been conducted abroad (i.e. USA and South Korea). With this evident gap in mind, there was a need to establish how grit performs within a South African DE institution, which comprises a broad cross-section of gender, age, socio-economic status and academic ability, such as that found at UNISA.

PURPOSE OF THE STUDY

With the aforementioned gap in mind, the current paper aimed to determine the relationship(s) between psychological grit, retention from first to second year and student success (operationalised as qualification completion) among a sample of honours students in an ODeL institution in South Africa. Prompted by this aim, the following question was conceptualised: How best could the relationship between grit, retention and degree completion be described among a sample of postgraduate students in a South African DE institution?

METHOD

Using a cross-sectional design and a census sampling technique, a link to an online version of the Grit-S survey was distributed to all the first-time entering honours students at the institution in the 2017 academic year (N = 8 689; Creswell, 2012). Those who completed the online survey within the allotted timeframe constituted the sample (n = 775), resulting in an overall response rate of 8.9%. One- and five-year lagged secondary data was then obtained (in the 2018 and 2022 academic years) to ascertain the retention and qualification completion status of each participant.

Participants

Demographics

(This study did not receive permission to obtain demographic statistics on the study population. As such, demographic information on the study sample could only be gathered by including a [demographics] section in the online survey.)

As mentioned, the sample comprised 775 honours students who registered for their honours qualification for the first time in 2017. Of these 775 students, over 70% were female (n = 547) and 29.4% were male (n = 228). On average, the sample of honours students were 33 years old (SD = 8.78 years). Most students were African (58.5%; n = 453), followed by white (27.5%; n = 213), Indian (6.2%; n = 48), mixed race (6.2%; n = 48) and Asian students (0.4%; n = 3). Ten students chose not to disclose their ethnicity. Close to one-third of the participants were English-speaking (29%; n = 225), followed by Afrikaans- (14.7%; n = 114) and IsiZulu-speaking students (14.2%; n = 110). Of the 775 students in the sample, 596 students were employed (76.9%), 86 were not employed (11.1%) and 62 were full-time students (8%). Over 98% reported that they had no disabilities (n = 760); of those 15 students who indicated a disability, the most commonly cited was a mental disorder/phobia (n = 5).

Retention and Success

Of the 775 honours students who comprised the sample, 107 students (13.8%) were not retained in the subsequent academic year (i.e. 2018), and 60.8% of the sample returned for their second year (n = 471). Over 25% of the sample completed their honours degree in one year (in 2017) and were thus excluded from the retention analyses and recoded as missing data (n = 197). These frequencies are shown in Table 2. Further analysis revealed that, of the 775 students, 79.4% had completed their honours degree over a five-year period (n = 615), whereas 160 students (20.6%) had not completed (as of 2022).

Table 2. First-to-second year retention rates (2017 to 2018)

	n	%
Not retained	107	13.8%
Retained	471	60.8%
Missing	197	25.4%

Data Collection and Analysis

As briefly mentioned, data was collected using an online survey which comprised several demographic items along with the eight items in the Grit-S scale. Following the data collection process, the data was analysed using structural equation modelling (SEM), an approach used to test and evaluate multivariate causal relationships (Fan et al., 2016). The psychometric soundness of the Grit-S scale was also explored among the sample. These analyses are presented below.

The Scale

Prior to SEM, a confirmatory factor analysis (CFA) was computed using AMOS (Version 28) to test the measurement model and assess the construct validity of the Grit-S scale. As part of the CFA, factor loadings were assessed for each item; these ranged from .17 (*Setbacks don't discourage me*) to .87 (*I am diligent*). Although the factor loading for Item 2 (*Setbacks don't discourage me*) was well below suggested cut-offs (i.e. < .40; Matsunaga, 2010), the item is central to the core concept of grit, and as a result, its inclusion is necessary to avoid construct under-representation (Furr & Bacharach, 2014). Moreover, the model-fit measures that were used to assess the model's overall goodness of fit (χ^2/df, *p*-value, GFI, CFI, NFI, TLI, RMSEA, SRMR) were all within their respective common acceptance levels, despite the low loading from Q2. The two-factor model (consisting of passion and perseverance) yielded a good fit to the data; χ^2/df = 2.45, GFI = .985, CFI = .983, NFI = .972, TLI = .975, RMSEA = .04, SRMR = .03. The two-factor measurement model, along with the standardised estimates, is depicted below.

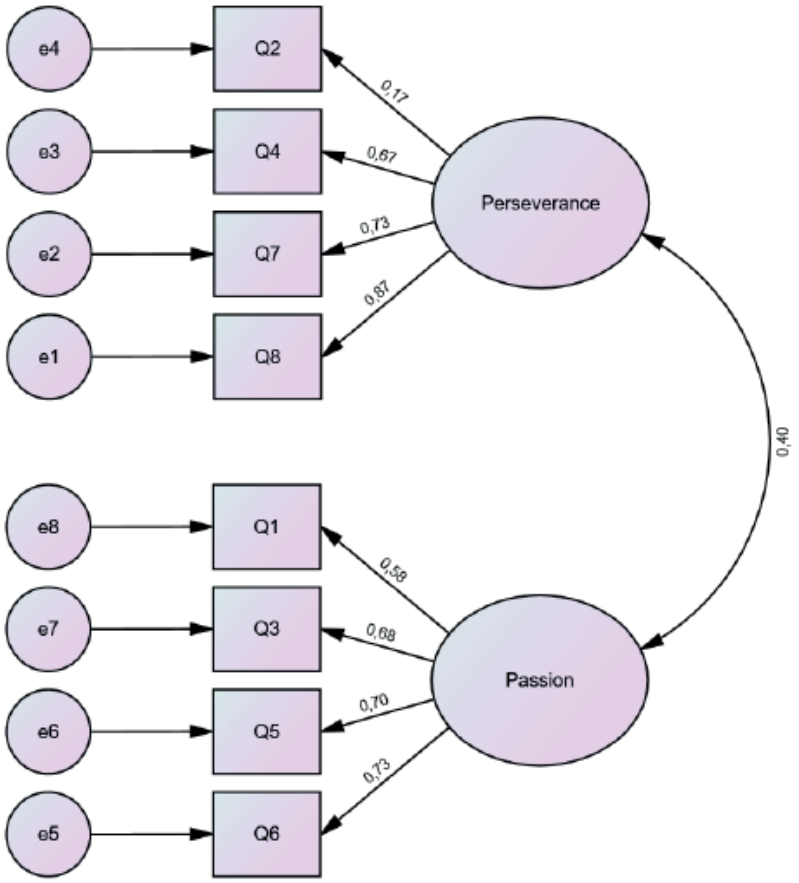

Figure 1. Two-factor measurement model of the Grit-S scale

Construct reliability was then assessed using Cronbach's alpha and composite reliability coefficients. Results revealed that both constructs, passion and perseverance, were reliable among the sample of honours students (n = 775), yielding Cronbach's alphas (α) of .62 and .77, respectively. Further evidence of construct reliability was provided by calculating composite reliability coefficients, both of which demonstrated acceptable levels of reliability (i.e. > .70). These results are shown in Table 3.

Table 3. Reliability of the Grit-S scale

Construct	Number of items	Cronbach's alpha (α)	Composite reliability (CR)
Passion	4	.768	.769
Perseverance	4/3	.618/.793*	.725

** Cronbach's alpha if 'Setbacks don't discourage me' is deleted*

Structural Equation Models

Following the CFA and reliability analyses, several structural models were built, and their fit assessed. The first SEM model aimed to ascertained grit's role (operationalised as passion and perseverance) in determining retention among the sample (prior to model fitting, missing data was removed), followed by a second model which positioned success (operationalised as qualification completion) as the dependent variable. The final model positioned success as the dependent variable, with grit and retention as the independent constructs. These models and their respective fit indices (χ^2/df, p-value, GFI, CFI, NFI, TLI, RMSEA, SRMR) are tabulated (and discussed) below.

Table 4. Model fit indices

Model	*N*	χ^2/df	p	GFI	CFI	NFI	TLI	RMSEA	SRMR
Passion, Perseverance, Retention	578	1.77	.010	.983	.983	.962	.976	.037	.036
Passion, Perseverance, Success	775	2.03	.002	.985	.984	.970	.977	.037	.032
Passion, Perseverance, Retention, Success	578	1.75	.005	.980	.981	.957	.974	.036	.043

Although the results of the first SEM (passion, perseverance, retention) revealed good fit to the data (as seen in Table 4), the path coefficients for perseverance and passion were not statistically significant (β = .05 and β=.09, respectively). The second SEM also demonstrated good fit to the data and produced a significant path between success and perseverance (β = .20; p < .01). The last model (with passion, perseverance and retention as the independent variables and success as the dependent variable) also showed good fit and exhibited two significant paths: one between perseverance and success (β = .20; p < .01), and the other between retention and success (β = .45; p < .01). The unstandardised coefficients, together with the standard errors (SE) and p-values of all three models, are tabulated below, along with a path diagram of the third model (in Figure 2).

Table 5. Unstandardised regression weights

Model	Constructs	Estimate	S.E.	C.R.	p
1	Retention <--- Perseverance	.026	.028	0.919	.358
	Retention <--- Passion	.041	.024	1.668	.095
2	Success <--- Perseverance	.111	.025	4.487	.001
	Success <--- Passion	.026	.021	1.211	.226
3	Success <--- Perseverance	.126	.029	4.375	.001
	Success <--- Passion	.004	.025	0.173	.863
	Success <--- Retention	.514	.042	12.357	.001

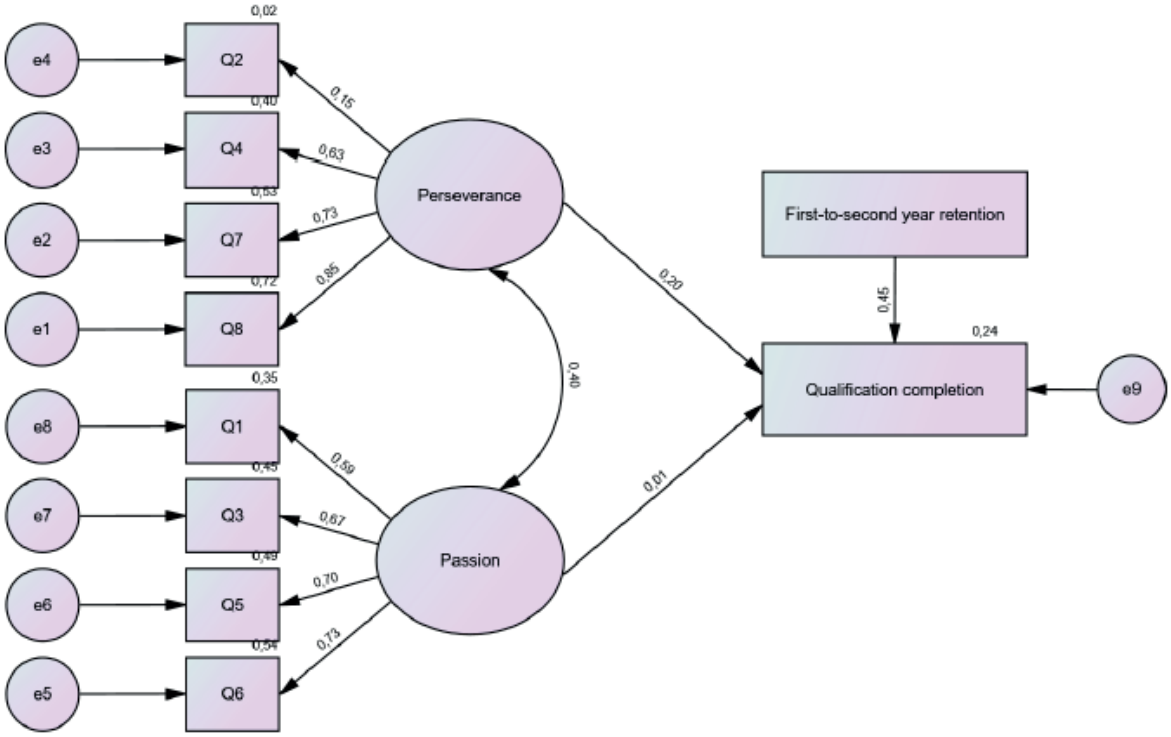

Figure 2. Structural equation model of grit, first-to-second year retention and student success (Third model)

Supplementary analyses were conducted to calculate the odds ratios (*OR*) of the significant paths identified above. In order to calculate *OR*s and considering the binary nature of the dependent variable (i.e. completed or not completed), a binary logistic regression was performed (both indicators were forced into the first block).. Results from the regression analysis revealed that both perseverance and retention (from first to second year) were significant predictors of qualification completion and produced respective *OR*s of 1.98 (95% CI: 1.45 - 2.69) and 12.15 (95% CI: 7.40 – 19.95). See Table 6 below for the regression coefficients, Wald statistics and the *p*-values.

Table 6. Variables in the equation

	B	S.E.	Wald	*df*	p-value	Exp(B)	95% C.I. for Exp(*B*)	
							Lower	Upper
First-to-second year retention	2.497	.253	97.443	1	< .001	12.151	7.400	19.950
Perseverance	0.681	.158	18.585	1	< .001	1.976	1.450	2.692
Constant	-3.700	.696	28.237	1	< .001	.025		

Sensitivity Analysis

Following the adoption of the third model, a sensitivity analysis was conducted to assess the impact of different specifications on the model. In particular, high- and low categories were established in the perseverance and passion domains using their respective medians (4.25 and 3.75). Although the model fit indices are similar to those reported above, the proportion of variance explained (in qualification completion rates) by each derivative of this model varies substantially (from 17% to 34%). These results are tabulated beneath.

Table 7. Sensitivity analysis: Model fit indices

Model derivative	*N*	χ^2/df	*p*	GFI	CFI	NFI	TLI	RMSEA	SRMR	r^2
Low perseverance (< 4.25)	283	1.40	.064	.968	.978	.927	.970	.038	.063	.26
High perseverance (≥ 4.25)	295	1.60	.015	.966	.949	.878	.930	.045	.057	.20
Low passion (< 3.75)	271	1.54	.025	.963	.948	.868	.929	.045	.060	.34
High passion (≥ 3.75)	307	1.06	.369	.978	.994	.915	.992	.014	.043	.17

DISCUSSION

Results from the data analysis allude to a number of pertinent points, the first of which relates to the psychometric properties of the Grit-S scale. Results from the CFA revealed that the two-factor model of grit (comprising passion and perseverance) fit the data exceptionally well (χ^2/df = 2.45, GFI = .985, CFI = .983, NFI = .972, TLI = .975, RMSEA = .04, SRMR = .03). In addition to this construct validity, the psychometric analysis also revealed that both latent constructs were soundly reliable among the honours sample, producing Cronbach's alpha coefficients above .62 and composite reliabilities above .73. Of particular relevance is the substantial gain noticed by the suggested removal of Item 2 (*Setbacks don't discourage me*), increasing Cronbach's alpha in the perseverance domain from .62 to .79. Although fairly novel in DE, these results are similar to those reported by Arco-Tirado, Fernandez-Martin and Hoyle (2018), Bowman, Hill, Denson and Bronkema (2015), Broghammer (2017), Fosnacht, Copridge and Sarraf (2018), Li (2015) and Wyszynska, Ponikiewska, Karaś, Najderska and Rogoza (2017), all of whom have noted concerns with this particular item among traditional student populations. Nonetheless, according to Nunnally and Bernstein (1994), if the composite reliability coefficient of a construct is above .70 (as is the case in the current paper), there is substantial evidence to support the reliability of the construct and thus warrant all items' inclusion.

The second pertinent point that emerged from the analyses is that psychological grit, or its two latent constructs rather, were *not* predictors of first-to-second year retention among the DE honours sample. Both path coefficients, although positive, were not significant ($p > .05$). Similar results, although scant and confined to traditional HE environments, have been reported by Broghammer (2017) and Rogalski (2018), both of whom revealed that grit was unable to significantly predict retention from one academic period to the next. For the most part, though, the results reported in the current paper differ from those commonly cited in grit literature, which reports significant relationships between retention and grit (Bowman et al., 2019; Duckworth et al., 2007; Duckworth & Quinn, 2009; Saunders-Scott et al., 2018).

Lastly, the results from the final structural model highlighted the significant influence of first-to-second year retention (β = .45) and perseverance (β = .20) on student success (operationalised at qualification completion). Both path coefficients were positive, indicating 1) that as one's perseverance increases, so too does the likelihood of completing an honours degree, and 2) retention from first to second year increases the likelihood of degree completion. Supplementary binary logistic regressions quantified these likelihoods; with an *OR* of 1.98 (95% CI: 1.45 – 2.69) calculated for perseverance and an *OR* of 12.15 (95% CI: 7.40 - 19.95) for retention. Regarding the latter, this result indicates that, when a student is retained from first to second year, the odds of completing an honours qualification are 12.15 times greater than the odds of not completing. Although substantially smaller, the *OR* for perseverance indicates that, when a student exhibits perseverance, the odds of that student completing an honours degree are 1.98 times greater than the odds of not completing. This final model explained 24.5% of the variance in qualification completion rates, with the biggest contributor being first-to-second year retention (β = .45; $p < .01$). Sensitivity analysis revealed that these path estimates and model fit indices are not sensitive to high (or low) scores on the grit domains; the proportion of variance explained (in student success rates), on the other hand, appeared sensitive to these derivatives.

Similar results have been reported by a plethora of researchers who operationalised student success using grade point averages (GPAs), academic performance, or course completion (Akos & Kretchmar, 2017; Beyhan, 2016; Broghammer, 2017; Duckworth et al., 2007; Hwang et al., 2017; Lee & Sohn, 2017; Mason, 2018; Muenks, Wigfield, Yang & O'Neal, 2017; Pate, Payakachat & Harrell, 2017; Reraki, Celik &

Saricam, 2015; Rogalski, 2018; Rojas & Tyler, 2018; Strayhorn, 2013; Terry & Peck, 2020; Wang & Baker, 2018). Collectively, these results reveal that psychological grit is significantly associated with and can predict GPA, performance and course completion in an array of tertiary settings, both contact and distance. More attuned to the current findings are those reported by Lee (2017), Wolters and Hussain (2015) and Xu, Meijs, Gijselaers, Neroni and De Groot (2020), who reveal that only the perseverance domain was significantly associated with - or could - predict student success (operationalised as academic performance, expected grades and course grades, respectively). Interestingly, passion had no influence on either of the student outcomes in this paper (i.e. retention or qualification completion), nor in those by Lee (2017) and Wolters and Hussain (2015). It did, however, correlate positively with course credits (r = 0.079) and exam attempt (r = 0.154) in the study by Xu et al. (2020).

LIMITATIONS AND IMPLICATIONS

No study is without limitation; and this study is no exception. Firstly, the non-experimental, cross-sectional design limits the ability to draw causal inferences around grit's role in determining student success among DE students in the country and does not lend itself to the exploration of these variables over extended periods of time. What's more, this study relied on self-report data which is often scrutinised for potential response-, social desirability- and acquiescence bias. And lastly, the study only sampled postgraduate students at one DE institution in South Africa; future research endeavours would benefit from the analysis of these variables among undergraduates at UNISA and other HEIs in the country.

Despite these limitations, the results have important implications for practice. Firstly, these findings suggest that cultivating or enhancing perseverance among DE students from the first or second year onwards could prove fruitful in improving ultimate qualification completion. This could take the form of including activities into support programmes aimed at developing a growth mindset, which has been linked to higher levels of grit (Hacisalihoglu, Stephens, Stephens, Johnson, & Edington, 2020; Kaya & Yuksel, 2022; Mas, Adi, & Amawidyati, 2023). First-year experience programmes are an ideal space, in the researchers' opinion, to host such activities as it would form part of the orientation to the institution and HE. The results also suggested that students who are retained from first-to-second year are 12 times more likely to complete their qualification, as such, another (practical) implication of this study is that retention strategies at DE institutions should focus their efforts on retaining students during the same two academic periods (i.e. from first year to second).

CONCLUSION

The results outlined above align with the majority of the literature which suggests that psychological grit is associated with student success in HE generally and in DE specifically, thus somewhat confirming the argument that grittier individuals are more likely to complete their tertiary studies. However, a caveat worth noting is the variance explained by the model, with grit (or the perseverance domain rather) accounting for only 4% of the variation in student success rates. Perspicuous in these findings is the bigger role played by environmental, socio-economic and institutional factors in addressing retention and academic success in a South African HE institution plagued by past inequalities. Further studies in this field should therefore seek to map the relationships between these factors (i.e. environmental, socio-economic and institutional) in relation to grit to gain a more comprehensive picture of student success in the South African DE landscape.

Acknowledgements: This work was supported by the University of South Africa's (UNISA) Master's and Doctoral Support Programme (MDSP).

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TEACHERS' READINESS FOR BLENDED LEARNING,THEIR REASONS, CHALLENGES, AND SUGGESTIONS FOR PRACTISING BLENDED LEARNING

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Received: 27/11/2022 **Accepted:** 11/01/2023

ABSTRACT

This study aims to understand the experiences of Turkish teachers in blended learning, the challenges they encountered, and their recommendations in this regard. The authors adapted the Blended Teaching Readiness Instrument (BTRI) (Archibald et al., 2021) to Turkish. Secondly, the reasons, challenges, and suggestions of teachers regarding blended learning were investigated. A total of 325 Turkish teachers were selected as the participant group in this survey. A criterion purposeful sampling method was used in the data collection process. The statistical analysis led to the conclusion that the BTRI, which was translated into Turkish, is a valid and reliable tool for measuring teachers' levels of readiness for blended learning in Turkiye and it can also be used to gauge the readiness of teachers. ort he qualitative aspect, inductive content analysis was used for analyzing open-ended questions of the instrument. The study both served as a reflection of Turkish teachers' positive and negative experiences regarding blended learning practices and a scale adaptation study for measuring the blended teaching readiness of Turkish teachers. It is considered that the results can help both pre-service and in-service teachers to be sensitive toward their blended teaching competencies. This study also has the potential for informing teacher education departments to equip prospective teachers with required disciplinary knowledge along with digital competencies.

Keywords: Blended learning, blended teaching, blended teaching readiness, instrument adaptation, teacher.

INTRODUCTION

In the educational technology area, blended learning has been labelled the "new normal" (Norberg et al., 2011) or the "new traditional model" (Ross & Gage, 2006). Despite the ambiguity surrounding its description, Graham (2013) defined blended learning as an instructional technique that combines traditional classroom methods with online digital methods. It necessitates both the teacher's and the student's physical presence, as well as some student control over time, setting, track, or pace (Huang, Lanqin, & Haisen 2009). In a recent definition of blended learning, it is referred to as "an instructional design approach which integrates online and/or virtual learning with face-to-face learning by decreasing seat-time in class and increasing out-door learning activities to facilitate learning from not just the teacher but from online learning communities as well." (Ates-Cobanoglu, 2020). Recently, Graham (2022) suggested a parsimonious definition of blended learning as the strategic combination of online and in-person learning. Online learning technology integration into face-to-face instruction has sparked a lot of interest and opened many research opportunities over the years. Due to its perceived efficiency in offering flexible, timely, and ongoing learning, blended learning is now considered the most effective and popular style of instruction used by educational institutions.

In a global context, the use of blended learning in classes has been investigated by many researchers. Graham (2022) noted that the physical layer which refers to modality/ media and pedagogical layer which refers to method that directly affects student learning are the key components of blended learning design. Herein, the teacher orchestrates the pedagogical aspect of blended learning which is critical of the success of a blended learning-teaching practice. As Wang et al. (2021) found out the teachers' ability and students' ability preparation are reported as the largest obstacles in effective blended learning practices. However, there is a gap in both academic studies and teacher education. Especially, the studies that focus on the blended teaching readiness of teachers are limited (Balci, 2017; Kosar, 2016; Kirmizi & Yapici, 2019; Rianto, 2022). Although these studies are significant in terms of providing positive perceptions of blended learning from teachers and learners, they are limited in terms of the number of accessed participants, their focus on affordances, and model restrictions. Moreover, Smith and Hill (2019) reviewed 97 articles about blended learning practices in higher education and drew conclusions on the gaps that blended learning is not yet fully embedded in higher education.

Archibald et al. (2021) implied that preparing pre-service teachers and in-service teachers for blended learning is necessary, nonetheless, most departments lack such kind of training. The authors argued that to provide necessary professional development activities for teachers, revealing the readiness levels of teachers can be a good starting point for fulfilling blended teaching requirements. However, present Turkish instruments for measuring blended teaching readiness of staff/teachers are relatively scarce. For e.g. Hosgorur and Adnan (2018) adapted Chi's (2015) readiness to teach online survey into the Turkish context for online teaching readiness of staff. Since Chi's (2015) survey is not a scale, statistically the researchers only can see descriptive results regarding staff readiness. On teachers blended/ e-learning readiness, Baran and Ozen (2019) adapted Hung's (2016) teacher readiness for online learning measure for teachers, and Polat et al. (2022) developed an e-learning readiness scale for K-12 teachers. Therefore, the present study is considered to help fill a gap in blended teaching readiness measurement studies.

By taking these research gaps into consideration, this study involved both Turkish adaptation of the Blended Teaching Readiness Instrument (BTRI) and an examination of the Turkish teachers' blended teaching experiences. To this end, the following research questions were investigated:

1. What are the statistical results of the adapted BTRI in terms of the validity and reliability of the scale?
2. What are the teachers' reasons for practicing blended learning in their courses?
3. What are the teachers' perceived challenges they faced during their blended courses?

4. What are the teachers' perceived advantages of their blended courses?
5. What suggestions do the teachers give to improve blended courses?

METHOD

This paper uses quantitative techniques ort he scale adaptation phase and also qualitative techniques to investigate the perceptions and experiences of Turkish teachers for blended learning in K-12 and higher education contexts (Creswell, 2011). Also, this study aimed to put forward teachers' suggestions and the problems they encountered in applying a blended learning model.

Participants

The study group consisted of 325 Turkish teachers in the academic year 2021-2022 who participated in this study. In this research, criterion purposeful sampling was applied and the teachers who are experienced in blended learning in Turkiye were chosen as participants. An online form was shared online through social media such as Twitter, Facebook, Instagram, and WhatsApp groups. The survey included a consent form, a section for demographics and qualitative survey questions. 180 teachers are female (55%) and 145 of them (45%) are male in our sampling.

Data Collection and Analysis

Blended Teaching Readiness Instrument (BTRI)

The data were collected via the Turkish version of the Blended Teaching Readiness Instrument (BTRI) which is obtained in the present study. Before starting the study, the authors got permission from Douglas E. Archibald via e-mail to translate the Blended Teaching Readiness Scale into Turkish. The BTRI comprises five sections, one for each of the four skills and one for the Dispositions. Apart from Online Integration, which includes 11, each part has eight statements. On a scale ranging from 1 to 6, participants rate the accuracy of each item, with "1" indicating very limited competence or agreement and "6" indicating considerable competence or agreement. Participants indicate to what extent they agree with statements. It takes approximately 15 minutes to complete the whole survey. The online form was shared with the participants through social media (such as Twitter, Facebook, Instagram, and WhatsApp groups).

Language Adaptation Process

The Blended Teaching Readiness Instrument (BTRI), which is used in the current study, was used to collect the data. BTRI is a competency framework designed to assist researchers and teachers with the purpose of determining the readiness of teachers for blended learning (Archibald et al., 2021). Besides being publicly available, it dwells solely on blended teaching. In the process of BTRI adaptation to Turkish, the following steps suggested by Hambleton and Kanjee (1993) as well as Hambleton and Bollwark (1991) were followed: (1) Translating items from the original language to the native/target language, (2) Determining the equivalence of the items in the original form and the draft form, (3) Determining the validity and reliability of the obtained form in Turkish.

In translating the scale items from the source language to the target language, two EFL instructors from Ege University and one from Bahcesehir University School of Foreign Languages were designated as translators. Three translators independently interpreted the scale's original language into Turkish. The Single Translation Method, one of the judicial techniques, was utilized to test the items' equivalency using both judicial and

statistical techniques (Hambleton & Bollwark, 1991). Another expert group was formed to prepare a suitable draft form for the culture to which the scale would be adapted. This expert group analyzed the words, concepts, and expressions used in initial Turkish translations. For this purpose, a group of three experts consisting of one instructional technology expert particularly studying blended learning and two English language experts.

The form was also examined by a Turkish language specialist. The applicability and understandability of it were then tested on 5 graduate students in the Ege University program for computer education and instructional technology. Additionally, the students' suggested improvements were taken into consideration.

Validity and Reliability

To determine the reliability and validity of translated Turkish scale in Turkiye, some psychometric features such as construct validity (exploratory and confirmatory factor analysis) and internal consistency (Cronbach's Alpha) were tested (Buyukozturk, 2009). Before exploratory factor analysis (EFA), Kaiser-Mayer-Oklin (KMO) test and Barlet Sphericity test were implemented to determine whether data were applicable for factor analysis. EFA was conducted by using Principal Components Analysis and Varimax Vertical Rotation Technique. Within the scope of the study, the data were collected from teachers working in different branches and the validity and reliability of the scale in the sample of teachers were tested.

Data Analysis

Inductive content analysis techniques were used to analyze the qualitative data (Miles & Huberman, 1994). We each worked on the coding system separately before discussing the similarities and differences to increase credibility (Patton, 2015). The following phase involved writing a codebook by considering the relevant literature and our research questions. Additionally, as Creswell (2011) advised, we double-coded the qualitative data to eliminate superfluous or redundant codes and combine our final codes into themes. The themes were verified and confirmed by two independent researchers during this process. Inter-coder reliability was calculated as 0.86 percent. Finally, the themes and codes were organized in tables to describe the findings.

FINDINGS

What Are the Statistical Results of The Adapted BTRI In Terms of The Validity and Reliability of The Scale?

The purpose of this study was to adapt the BITRI developed by Archibald et al. (2021) into Turkish. To examine factorial structure of the BITRI, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used in the study. A total of 325 K12 teachers from Turkiye participated in the study. Principal Axis Factoring was preferred as the factoring method for EFA. The K1 eigenvalue method proposed by Kaiser (1960) was used to decide on the number of factors. Since it was determined that there was a relationship between the factors due to the structure of the original scale, it was run with the Oblimin technique as the rotation technique. For EFA, 247 participants were piloted. As a result of the EFA performed, it was determined that two items were found to be overlapping. The factor structure and factor loadings of the items, which emerged according to the EFA results after the related items were removed, are presented in Table 1.

Table 1. Factor Loadings

Items	1 Dispositions	2 Online Integration	3 Data Practices	4 Personalization	5 Online Interaction
D6	0.914				
D7	0.851				
D4	0.836				
D5	0.825				
D9	0.820				
D8	0.807				
D10	0.752				
D3	0.748				
D2	0.649				
D11	0.648				
D1	0.643				
OIM7		0.880			
OIM4		0.862			
OIM2		0.843			
OIM5		0.828			
OIM1		0.792			
OIM8		0.751			
OIM6		0.733			
OIM3		0.697			
DP4			0.880		
DP5			0.816		
DP3			0.744		
DP8			0.741		
DP7			0.685		
DP2			0.654		
DP1			0.622		
P5				0.744	
P6				0.737	
P7				0.727	
P2				0.722	
P4				0.621	
P3				0.610	
P1				0.601	
P8				0.564	
OI4					0.814
OI6					0.765
OI3					0.729
OI7					0.722
OI5					0.721
OI2					0.628
OI8					0.609
Variance	21.2	15.1	14.2	15.2	14.0

As seen in Table 1, a five-factor structure emerges as in the original scale. When factor loads were examined, it was determined that the factor loads of all items were higher than 0.50 and there were no overlapping items. The Kaiser-Meyer-Olkin value calculated to evaluate the suitability of the data set for factor analysis was found to be 0.96. Field (2009) claimed that a value higher than 0.80 can be described as a good fit. However, the Barlett test of the sphericity coefficient was found to be statistically significant ($p<0.01$). Relevant values were found to be within the expected value ranges. Therefore, the analyses show that the number of participants responding to the scale was sufficient and that the data set could be factored (Hair, Black, Babin, & Anderson, 2014). In line with the relevant analyses carried out, it was concluded that a total of 41 items were patterned under five factors. Five related factors explain 79.70% of the total variance. According to EFA findings, the present instrument's factor structure resembled the originals.

The correlated five-factor model is based on the item-structure correlation resulting from the EFA. In other words, it assumes that scale items measure five related sub-dimensions. CFA was performed to confirm the structure revealed by EFA on a different sample group. A total of 325 participants were reached for CFA. Relevant data were collected electronically. The data-model goodness-of-fit index values were obtained because of the data analysis with CFA; the results obtained are shown in Table 2.

Table 2. Data-Model Goodness of Fit Index Values

Models / Data-model fit indexes	χ2/sd	RMSEA	NFI	sRMR	CFI
Five-factor Model	2.875	.076	.971	.032	.921

A ratio of chi-square (X2) and degrees of freedom below three indicates a perfect fit, and below five indicates a good fit (Kline, 2005). This rate was found to be 2,875. Therefore, it is shown that the data-model fit is quite good. When the results in Table 2 are analyzed according to the ideal fit index values suggested by Harrington (2009) (RMSEA < 0.08; NFI > 0.90; sRMR < 0.08; CFI > 0.90); It is observed that the related five-factor model is obtained from the analysis of well-suited values regarding model-data fit.

The item-construct parameters (standardized factor loads and relations between constructs) obtained by analyzing the related three-factor measurement model because of first-level CFA are shown in Figure 1.

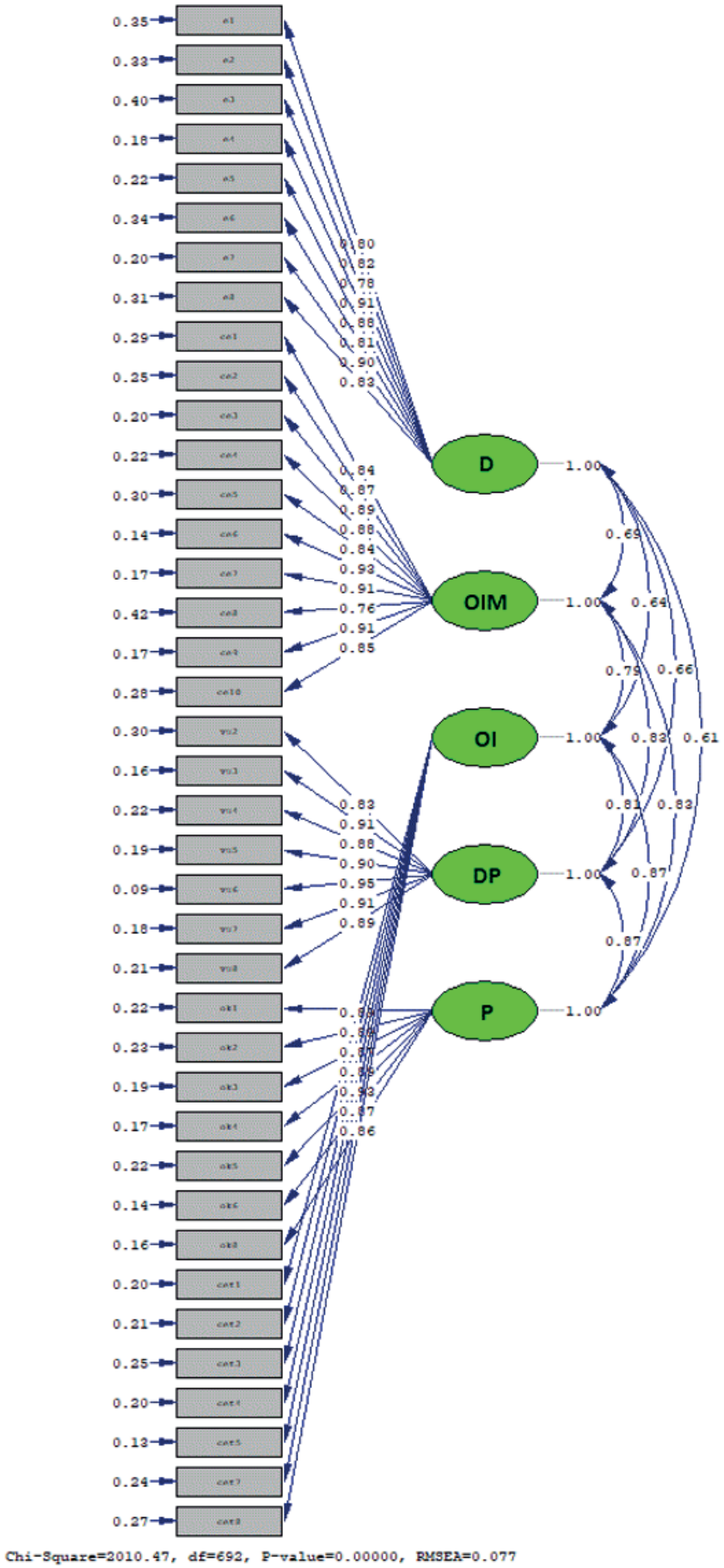

Figure 1. Structural model of the BTRI

The item-structure parameters in Figure 1 indicated that the standardized factor loadings of the five different sub-dimensions of the relevant model vary between 0.76 and 0.93. Factor loadings were determined to be statistically significant according to the t-value test. Brown (2015) stated that in CFA solutions, item factor loads should be greater than 0.5 and significance should be achieved in terms of t value. CFA solutions for the relevant model. This shows that results like the item-structure pattern that emerged as a result of the exploratory factor analysis were achieved, and the factorial validity of the related scale was achieved. The CFA results demonstrated that a satisfactory match was indicated by the goodness of fit indexes. Considering the findings, it may be concluded that the BITRI is suitable for usage in Turkish culture.

What Are the Teachers' Reasons for Practicing Blended Learning in Their Courses?

Three major reasons for including blended learning in English instruction were noted by the participating teachers. These reasons all focus on the environment, teachers and learners, and the technical and technology implementation. Table 3 demonstrates the reasons for using the blended learning model in classes.

Table 3. Reasons for using Blended Learning Model in Classes

Codes	Sub-categories	Number of participants discussing them	Participant Comments
Environment	Pandemic	71	-…That was an obligation due to the pandemic…
			-…because of recent developments like COVID-19…
			-…The fact that we could not have f2f classes because of the pandemic…
	Top-down change	32	-…This is not my personal choice now. The institution I work for uses this hybrid system but had positive experiences as I got the hang of it…
Learners / Teachers	Time Efficiency	40	-…I use it to save more time…
			-…it saves time when we apply the f2f part…
			-…it saves the time to be spent commuting to school…
			-…as a person who values time management, I could say that it helps me to be active and efficient in the learning and teaching process…
	21st Century Learners	39	-…to be able to use 21st century skills…
			-...at the same time, it improves social relationships of learners and allows their 21st century skills …
	Improvement In participation	22	-…it helps to increase active participation…
			-…to provide more time for participation and in-class activities…
Technical & Technological implementation	Improvements in Technological Competence	43	-…because students are interested in technology…
			-…students could adapt to technological developments easily…
	Accessibility	21	-…accessibility and to benefit from online learning communities provided by technological tools…
			-…It provides the convenience of reaching the desired target vehicles without limitations of place and time…

As can be seen from Table 3, participating teachers commented on three broad issues by specifically focusing on pandemic, top-down change policies for environment-related reasons. As one participant commented: "That was an obligation due to the pandemic…". In relation to the environment, another participant stated that "…This is not my personal choice for the moment. The institution I work for uses this hybrid system but had positive experiences as I got the hang of it…". These excerpts show that a great majority of the teachers explained the reason for choosing blended learning as top-down and obligatory due to the pandemic.

The second code, which is concerned with the learners' and teachers' aspect, time-efficiency, characteristics of 21st-century learners, and participation increase are the main reasons for applying blended learning. As one participant stated: "as a person who values time management, I could say that it helps me to be active and efficient in the learning and teaching process….". Another teacher put it to save commuting time. This could be relevant, especially for teachers who reside in big cities. Learner characteristics are another striking result derived from the analysis. Many teachers believe that blended learning is helpful for employing 21st-century skills. Accordingly, one informant reported that "-...at the same time, it improves social relationships of learners and allows their 21st-century skills …".

The third code is related to the technical and technological dimensions of blending learning. Participating teachers claimed that blended learning is instrumental in improving technological competence because as one of the teachers stated: "students could adapt to technological developments easily" and "because students are interested in technology". The last sub-code is about accessibility. For example, one teacher explained it as "It provides the convenience of reaching the desired target vehicles without limitations of place and time". Similarly, another participant commented as: "…accessibility and to benefit from online learning communities provided by technological tools".

What Are the Teachers' Perceived Challenges They Faced During Their Blended Courses?

Table 4 illustrates two major blended learning-related issues of English instruction noted by the teachers. Surprisingly, the teachers explained these issues in relation to the teacher, the learner, and the technical and technology implementation like the responses in Table 1. As can be observed in Table 4, teachers'/students' unpreparedness for online teaching and increased burden induced by the various tasks of online teaching/learning are the two teacher/student-related online instruction challenges.

Table 4. Challenges of using Blended Learning Model in Classes

Codes	Sub-categories	Number of participants discussing them	Participant Comments
Variables	Inequality of technology accessibility	87	-…systemic failures of electronic devices…
			-…not all my students have computers/laptops at home. Some of them follow the content from their parents' phones…
	Need for technological competence (teachers/ students/parents)	32	-…I felt the need to start learning new techniques like a student. I have completed almost 20 years of my profession with classical face-to-face training methods…
	Requirements of specific infrastructure	12	-…slow internet connection, technical problems such as electricity cut, etc…
			-…struggling for accessing to the person in charge of maintenance …
	Cost of web tools and quality materials	23	-…The school did not supply a free video-conferencing tool, so we all used a zoom free edition. Lessons were 30 minutes and when the time was up the system kicked us out of the virtual classroom…
			-…It was hard to create digital materials…
			-…Finding quality material was time-consuming…
Learners/ Teachers	Teachers' / Learners' readiness	16	-…Every day I try to help my learners. They have trouble even finding their assignments…
	Time-consuming	65	-…I spent more time online preparing for my classes…
	Resistance to change/ adaptation issues	15	-…students were not familiar with the online systems. I responded to more than 30 messages each day. Many of the messages were negative things about the system.…

As can be seen from Table 4, teachers were heavily influenced by technical and technological challenges. For example, a teacher commented: "-…not all my students have computers/laptops at home. Some of them follow the content from their parent's phone.". This is one of the recurrent themes concerning the inequality of accessibility. Another recurrent theme is the need for technological competence. As one of the teachers explained, "I felt the need to start learning new techniques like a student. I have completed almost 20 years of my profession with classical face-to-face training methods". The cost of web materials is another important issue stated by the teachers. As indicated in Table 2, the teachers had a hard time accessing and creating quality digital materials. The last sub-category shows that both teachers' and learners' readiness and adaptation could be an issue for the success of blended learning. The time-consuming aspect of preparing materials is a common theme among teachers. As one of them commented:" As a teacher, I spent more time online preparing my classes".

What Are the Teachers' Perceived Advantages of Blended Courses?

On the other hand, two main blended learning advantages of English instruction were noted by educators. These advantages are related to the learning environment and skills at a broader level. These advantages are summarised in Table 5.

Table 5. Advantages of using Blended Learning Model in Classes

Codes	Sub-categories	Number of participants discussing them	Participant Comments
Learning Environment	Self-regulated learning	23	-...because I think students should take initiative in learning
	Immediate feedback	12	-...fast and practical and it allows for immediate feedback…
	Increased interaction & collaboration	13	-...It is helpful for increasing interaction and quality of instruction…
	Flexible Learning Environment	12	-…to be able to integrate online tools to the lesson very easily…
	Personalized Learning Environment	14	-...the fact that it provides space for personalized learning…
Learning Process	Improving listening skills of learners	12	-…also, it is very important for improving listening skills in English lessons as well as accessing more resources…
	Improving speaking & writing skills of learners	13	-... used it for using more activities to improve learners' writing and speaking skills and for engaging more learners…
			-…I used it to give feedback on learners' writing products and do extra speaking activities…

When these broad perspectives are analyzed, we can see that the teachers found blended learning advantageous in terms of self-regulated learning provision, giving immediate feedback to learners and increasing interaction and collaboration among them as well as a personalized and flexible learning environment. As the teachers reported:" -...it is helpful for increasing interaction and quality of instruction"; the fact that it provides space for personalized learning"; Because I think students should take initiative in learning". Furthermore, the participants focused on the improvement of specific language learning and teaching skills such as listening, speaking, and writing. For instance, one teacher stated that "used it for using more activities to improve learners' writing and speaking skills and for engaging more learners", or "also it is very important for improving listening skills in English lessons as well as accessing more resources".

What Suggestions Do the Teachers Give to Improve Blended Courses?

Several positive suggestions were given by the teachers in their answers to the open-ended question. To address this research variable, the respondents were asked to give suggestions for blended learning environments. As shown in Table 6, most teachers expressed two main codes which are engagement and management-related suggestions.

Table 6. Teachers' Suggestions for Blended Courses

Codes	Sub-categories	Number of participants discussing them	Participant Comments
Engagement related suggestions.	Ownership and social presence	25	-… To make the environment interactive and collaborative place. -…Trying to build a relationship. -…To fight low student engagement, and low motivation teachers need to include activities that enable students to learn at their own pace, attract students' attention and help them experience a sense of success, the problems encountered have been dealt with to some extent.
	Instructions and criteria that are clear and unambiguous	27	-…tutorials need to be prepared for the learners on how to submit assignments or find the online components of the class…
	Authentic tasks	23	-… the students did not do the activities I sent. I developed authentic tasks that increase their motivation…
	Class time needs to concern hands-on activities.	37	-… Students' silence in live lessons by trying to do activities that will make students active… -… The biggest challenge is student participation, even if the student comes to the lesson or the camera is on, sometimes it is difficult to stay there mentally. It is necessary to design an activity that will ensure the active participation of students…
	Asynchronous time needs to be designed effectively.	8	-… The distance part of the course should be designed in a way that students can do it by themselves. …
	Feedback	5	-… Giving feedback after evaluation and ensuring that students use technological tools correctly. I still can't spare the necessary time for giving feedback due to the workload, but I do lectures and demonstrations in my class on how students should use the tools…
Management-related suggestions	Technical problems need to be detected and solved	32	-…There may be a shortage of tools, I personally do the completion… -… Students do not have sufficient equipment, do not have the internet at home, and cannot use laptop/smartphone features… -… Making use of technology, developing technological solutions where face-to-face education is lacking and limited…
	Rewards need to be given best practices.	33	-… To give teachers points and incentives to encourage the blended learning environment.
	Schools need to provide time for blended course planning.	25	-… School management needs to organize teacher time to provide time for course planning…
	Teacher training programs need to be created and given.	12	-… I had no preparation and training. Teacher training should be planned by field experts…
	Professional learning communities need to be built voluntarily.	23	-…in-service training should be based on volunteering… -…opportunities for teachers to share good practices should be provided and good practices should be appreciated by management…

DISCUSSIONS AND CONCLUSION

Graham et al. (2019) denoted that effective blended teaching requires teachers to develop teaching skills for both online and face-to-face learning settings and there is a significant increase in demand for online and BL options; however, the increase in efforts to prepare teachers for that demand is insufficient. It is considered that revealing the readiness levels of teachers as part of needs analysis is critical for improving present blended teaching skills for effective practices. Therefore, the study has two purposes: First, it covers a scale adaptation of BTRI to Turkish and second the examination of the blended learning experiences of Turkish teachers as well as their suggestions and solutions for the problems they encountered during the process.

For the first phase, the scale was applied to the teacher sample which is different from the original scale. Archibald et al. (2021) suggested testing the model they put forward in their study in in-service teachers and international contexts. So, it is considered that the above-mentioned statistical results for the Turkish form the BTRI is helpful for blended learning researchers.

For the second phase, the overall qualitative results suggest that blended learning is perceived to be beneficial for learners by the teachers. Six of the six aspects of blended learning (according to Tang & Chaw, 2013) were investigated in this study. These include learning flexibility, technology availability, and utilization, online interaction, classroom learning, online learning, technology attitude, and study management.

At a broad level, the results of this study are in accord with prior research in terms of developing students' language learning, increasing students' engagement and motivation, and finally enhancing the learning environment. As a direct contribution to the relevant literature, the findings indicate that despite the teachers' positive perceptions of blended learning and its potential affordances, several challenges were mentioned regarding its implementation under the broad category of technical and technological problems such as inequality in accessing technology, the requirement of certain infrastructures, cost of web tools and quality materials, being time-consuming, teachers' and learners' readiness and resistance to change and this finding is parallel to the relevant literature (Kara & Liman-Kaban, 2023; Liman-Kaban & Boy-Ergul, 2020).

Also, our results confirmed that blended learning practices do not always lessen time in the classroom or the requirement for traditional infrastructure, but they do necessitate an initial investment and time commitment in the development of blended learning tools and courses. As a result, it is critical to verify that this investment yields specific and measurable results in terms of student progress and success as compared to traditional teaching approaches.

The shifting responsibilities of instructors and students, a lack of community building and training in blended settings, and a lack of familiarity with new technologies were also issues that teacher cited (Koc & Ates-Cobanoglu, 2020; Rianto, 2022; Yang, 2014). Changing the role of instructors in blended learning environments appears to be a significant difficulty in our data as well and this finding is parallel to the relevant literature (Altay & Altay, 2022; Liman-Kaban & Yataganbaba, 2022; Yang, 2014).

Nevertheless, some techniques might be offered to the teachers to help them deal with the difficulties. As an illustration, blended courses must begin with a face-to-face introduction phase, especially for lower-level students (Kobayashi & Little, 2011). Additionally, according to Yang (2012), doing so will enable students to put what they have learned from in-person training into practice. Similarly, Hong and Samimy (2010) advised language teachers to employ integrated computer-assisted language learning techniques for successful blended learning experiences.

Moreover, the proficiency level of the students, the amount of time they spent on the program, the restrictions, and the ICT literacy level are all factors that teachers should be aware of because they can affect how the learners perceive the value of blended learning and their satisfaction (Altay & Altay, 2022; Koc & Ates-Cobanoglu, 2020; Kobayashi & Little, 2011). By taking these factors into consideration, they could design better-blended learning environments and there would be a high chance of increasing learner motivation and interaction.

Additionally, workshops for teachers should be provided to equip them for the blended learning environment (Liman-Kaban & Yataganbaba, 2022; Koc & Ates-Cobanoglu, 2020; Yang, 2014). The same studies urge teachers to hold more discussions with their students and to impart their knowledge on blended learning

in a blended learning community. It is advised that educators who create blended learning environments seek out any institutional technological assistance they can to enhance their blended courses (Chan, 2014; Rianto, 2022).

Overall, this study has several findings, including attempting to contribute to the analysis of current, educationally important subjects, comparing participants' opinions toward both traditional and digital classrooms, and considering various facets of blended learning. This study, on the other hand, has several limitations. For instance, it consists of the teachers' perspectives only, thus its generalizability potential is limited. To overcome this, same questions could be addressed to the learners. Also, if the data were collected by means of interviews, more in-depth responses could have been received. Moreover, these findings are limited to teachers' perceptions and experiences, thus, classroom observations or even video recordings might be useful in comparing the teachers' perceptions and actual practices to obtain a thorough perspective in relation to challenges and opportunities.

All things considered, it could be said that any consideration of blended learning requires a solid understanding of why we, as educators, should offer blended learning to our context, but most importantly in what ways blended learning could support and improve their learning outcomes by taking the experiences and suggestions of teachers into consideration, and this study is a good example for it.

These findings, although limited to the teachers' experiences and perceptions, may help us to understand how crucial it is to provide training for teachers and learners. As indicated by the participating teachers, most of them did not have training in using blended learning models in their pre-service or in-service education. Therefore, by considering the needs of the teaching contexts and culture, teachers at all levels should be trained to deliver blended teaching which was also suggested by Archibald et al. (2021). Education faculties can offer theoretical and practical courses for all teacher candidates. As for in-service teacher education, workshops can be organised for teachers specifically focusing on task design and the use of technological tools in online and face-to-face contexts. The authors agree with Joosten et al. (2021, p.26) implying that "as faculty experience faculty and professional development opportunities to learn more about creating active and meaningful interactions with students for blended courses, their teaching may be forever changed." Therefore, it is considered that the teachers need to be encouraged to improve blended learning and teaching experiences and skills for meaningful and active teaching in a digital age.

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A RESEARCH ON THE EFFICIENCY OF DISTANCE EDUCATION IN UNIVERSITIES DURING THE PANDEMIC

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Received: 20/07/2023 **Accepted:** 09/08/2023

ABSTRACT

During the pandemic period, there have been such upheavals from production methods to distribution strategies, and from supply methods to corporate functioning. Accordingly, it would not be wrong to say that all companies and sectors, regardless of national or international, are part of this fundamental transformation. When the education sector was evaluated from the same perspective, it is possible to say that it is one of the sectors most affected by the differences created by this pandemic. For instance, very soon after the pandemic, almost all higher education institutions switched to distance education activities instead of face-to-face education. This study aims to examine the effects of the devastation caused by the pandemic on students at the higher education level in the context of efficiency. In this research, the criteria has been set as which university students' efficiency was achieved during the distance education process, and the research included 1604 participants from 15 universities, who formed the study's sample. The data obtained was subjected to reliability and validity analysis, and it was by using the SPSS program, and the results were examined with different dimensions.

Keywords: Covid-19, pandemic, distance education, efficiency.

INTRODUCTION

When the pandemic process was analyzed, it is seen that there is a transition from face-to-face education to distance education applications, and this transition is gradually starting to normalize. Although we are inclined for this transition in the digital age, the negativities brought by the pandemic period necessitated an urgent system change around the world. In this context, the shortcomings and adaptation processes caused by being caught unprepared for the current process, have led to some negativity in the education system. Many deficiencies or problems which were encountered encountered in the beginning days decreased over time, but the efficiency phenomenon, which is the main subject of this research, appears problematic in itself.

The point of this study is to examine in detail how and with which methods distance education activities are carried out in universities in Turkiye during the pandemic period. Moreover, it is aimed to reveal the level of efficiency achieved by university students who are the recipients of distance education applications from these methods. In this paper, firstly the literature study is included. In this section the impact of the pandemic on education, ethical concerns that may arise in educational practices in this period, and the application phase of distance education processes are mentioned. In our study, we attempted to determine what was done, what could not have been done, what was right or wrong, and what should have been done about the education processes during the pandemic. We can point out two reasons that distinguish this study from others conducted

on distance education and took place during the pandemic period. The first is that it takes Istanbul, which has the highest number of higher education institutions in Turkiye and hosts students from 81 provinces, as its sample, and the second is that it has a scientific approach that examines the distance education process through many different dimensions. The data obtained from an important sample group of 1604 students from 15 universities and it was analyzed with statistical methods suitable for the determined purpose. We believe that the results obtained within the scope of the study will contribute to both educational institutions and academic staff in all kinds of arrangements to be made in distance education applications.

LITERATURE REVIEW

The Covid-19 pandemic, which firstly came to the agenda in the world and then broke out in our country in 2020, has disrupted all activities taking place in the public sphere globally. Various measures have been taken to prevent the spread of the virus and to avoid the pandemic. The beginning of these measures was shifting business life to home, and that was followed by continuing all levels of education with the distance education method. As of March 16, 2020, education has been suspended throughout Turkiye and as of March 23, 2020, face-to-face education has been replaced by distance education. As a result of this circumstance, it can be seen that the pandemic created a huge impact on education, and it a new period started. Most scholars, academicians, and tutors could not know how to manage in this process. Therefore, both tutors and students strived to understand o fully comprehend (Stewart, 2021, p.89).

Researchers working in fields such as distance education and teaching technologies have used the concept of 'emergency distance education' to distinguish the pandemic period from distance education carried out under ordinary conditions. Hodges prefers the word 'teaching 'instead of 'education'. The reason for such a word choice is that this process is mostly carried out under the responsibility of teachers (Yildirim, 2020, p. 9). The concept of 'emergency distance education' comes up as a teaching/learning method applied during the pandemic period and similar cases. The concept is based on the fact that distance education is a method that is currently applied. Thus, in addition to the concept of distance education in the field of educational sciences, the concept of emergency distance education has come to the fore with the pandemic.

The terms of emergency distance education and distance education have become compulsory becauuse of the fact that the popularity of them have increased. Furthermore, these phenomena have taught educators what vulnerabilities and strenght sides of this education method are (Bozkurt, et al., 2022, p. 883). Emergency distance education is defined as an instructional communication method born out of necessity that emerged with the pandemic process. Distance education, on the other hand, is a multidisciplinary education ecosystem with many different components including planned learning and teaching activities. The difference between emergency distance education and distance education emerges at this point. Emergency distance education does not aim to establish a long-term sustainable learning ecosystem. Distance education, on the other hand, is planned, systematic, and based on strong theoretical foundations (Sezgin, 2021, p. 275). Emergency distance education is also described as the stage of action by stakeholders regarding education practices (Bozkurt, 2020, p. 116). Golden, on the other hand, preferred to use the concept of 'temporary distance education' instead of 'urgent distance education/teaching' (Yildirim, 2020, p. 9). Unlike the existing concept of distance education, these concepts, which are included in the literature, are the outcomes of the pandemic period. Since emergency distance, education/training or temporary distance education covers a limited period, and both teachers and learners continue to experience the current process while the pandemic period carries on, the 'urgent' part of the concept has lost its function over time. This is because distance education methods have still been advancing through developing new strategies, despite the initial purpose was to implement them particularly at the beginning of the pandemic period. Therefore, while distance education is a new and different method for both teachers and students, it has gained a normal dimension over time.

With the 2021-2022 academic year, distance education has become a part of the education process, especially at the higher education level. During this period, some universities continued distance education to a large extent. Moreover, some adopted the hybrid education method and provided courses to be taught both online and in the classroom (Adedoyin & Soykan, 2020, p. 6). In this way, a variety of students have developed themselves both academically and intellectually. In addition, the decision to offer forty percent of the courses in the curriculum online was notified to the universities by the Council of Higher Education in Turkiye.

With distance education replacing face-to-face education, protection of personal data in virtual environments, digital media literacy, and ethical awareness issues come to the fore. With regard to that, ethical framework in distance education should be determined for educational institutions, educators, and students. The determination of ethical boundaries in distance education prevents unethical and legal problems that may occur during education conducted in online environments. In this context, educational institutions must provide orientation training to both educators and students by mentioning the law on the protection of personal data, the ethical boundaries in distance education, and the problems that may arise when starting the distance education process. At the same time, educational institutions offer texts containing ethical rules prepared with names such as 'consent text, manifesto and ethical rules' to students in an online educational environment to prevent ethical violations while applying for exams during the distance education process. Therefore, while educators are informed by the institution, students are also informed through these texts during the distance education process. The extent to which informing students can prevent ethical violations in distance education is a controversial issue. Because avoiding ethical violations covers the behaviors that are put into action as a result of the individual point of view. It can be said that students who have individual ethical awareness take these warnings and texts more into consideration in the distance education process.

Within the scope of higher education, the Higher Education Quality Board of Turkiye has carried out a study regarding the problems experienced with the transition to distance education, and presented components that are set for the establishment of a quality assurance system in distance education. The components that a qualified distance education system should have a distance education policy, infrastructure opportunities, access conditions, qualifications, education and training processes, expert human resources, support services, information security, and ethical dimensions. Within the scope of information security and ethical dimensions in distance education, a large amount of data is recorded as a result of the interaction of the distance education system between educators, students, and the resources used and with the relevant higher education institution. In this case, a highly significant matter is how much of this data will be accessed, by whom, for what purposes, and under what conditions. In addition to the data accession, other important points are how the confidentiality of personal information will be ensured in resource generation and sharing. So, what the ethical principles are in the interaction of educator-student, student-student, student-institution, or educator-institution and how to protect these ethical principles should be determined and systematized (YOKAK, 2020). It can be said that within the framework of the ethical principles and system developed by institutions which provide education at the higher education level, ethical concerns that may arise for educators and students can be minimized or completely avoided.

Distance Education and Application Process

The instructors, who have sufficient knowledge and equipment about distance education applications, were able acquire positive results with the conveniences brought by information technologies, despite the conditions of education having been provided in distance. (Ersoz & Ozmen, 2020, p. 175). Many universities carried out studies that would enable them to give common compulsory courses with distance education methods before the pandemic period. Moreover, online settings provide a lot of opportunities for learners. As an illustration, authentic tasks can motivate students to study, while in classrooms, it just enables with teachers (Meri Yilan, 2023, p. 180). However, the practice of distance education in all departments and education levels of a university has been a situation encountered for the first time during the pandemic period.

It has brought some problems as well as advantages of providing education entirely through distance education applications (Kurnaz & Sercemeli, 2020, p. 266). For example, educators who ~~try~~ tried to teach classes through distance education practices, but experienced shortcomings in using these applications and teaching lessons, had a situation of coping psychologically with the difficulties of this situation (Ersoz & Ozmen, 2020, p. 175). Contrary to this situation, educators and students have also attained some gains through distance education systems (Altiparmak et al., 2011, p. 320):

- Educator-student interaction, which continues their lives in different environments, has been provided.
- With the increase in distance education activities, students have the opportunity to benefit from educational institutions in different parts of the world.

When the research conducted is evaluated, it is necessary to design an educational model by conducting a systematic and comprehensive study of online learning processes. There was no such design in the education given during the pandemic period and defined as emergency distance education. In other words, within about a year, was it possible to create a model or support system that would nurture students in every sense, such as resources that students can access and environments where they can interact outside of the classroom? When evaluated in terms of the applications made and their results, the situations in question have reached a significant degree of success (Erkut, 2020, p. 128).

The explanations made by scientists show that even if the pandemic period we are in is taken under control, it is not far from the possibility that we will encounter similar pandemic periods again. In this context, it is very important to analyze, evaluate and take forward-looking measures in a wide range of distance education applications both before and during the pandemic period (Basaran et al., 2020, p. 371).

As a requirement of the distance education system, students had to continue their education on their own. This situation causes problems such as lack of interaction, loneliness, and lack of communication. Considering these problems, the most functional learning methods should be preferred in the distance education system (Ekici, 2003, p. 48-49). It is thought that efficiency can be obtained from this education model by making use of the advantages brought by distance education and by producing solutions that will minimize the disadvantages.

The prominent feature of the technologies used in distance education is that they provide students with the opportunity to be independent of time and place. It is thought that distance education will be as successful as morning classes if the interaction and communication between students and teachers in distance education can be provided at an efficient level (Yilmaz & Horzum, 2005, p. 111). However, it should be noted that the differences and specific details within the ecosystem of the relevant scientific discipline must be taken into account. It should also be said that the value of face-to-face education is an undeniable fact.

METHODOLOGY

Within the scope of the study, primarily the superstructure of the methodology was designed and an evaluation was made on the number of students in higher education institutions in Turkiye. In this context, the first part of which sample from the main population would be determined within the framework of which limitations and constraints has been designed. Perhaps it was one of the most crucial parts of the research because the sample to be selected and the criteria determined had to be created to fully reflect the main population. The website of the Presidency of the Council of Higher Education in Turkiye, which is the most reliable and clear source of student statistics, istatistik.yok.gov.tr was the primary source used at this stage. The period to cover was decided as 3 semesters within the scope of the study. After reaching the current student numbers as of the beginning of the 2021-2022 academic year, the question of how to choose among 207 universities in Turkiye arose. First of all, such a choice should have been made so that it could both express itself in general and have the ability to represent higher education institutions in terms of student selection. In this context, Istanbul has been the primary reason for preference, as it has the largest crowd in terms of the number of universities and student population. It is extremely important to indicate that being the city which hosts students from 80 other cities of Turkiye, we believe that Istanbul could truly reflect the country. For this reason, all hesitations about conducting research at universities in Istanbul disappeared. Next was the determination of the type of education. In the study, students studying in the morning classes and night classes formed the second ring of the sample. The third step for constructing the superstructure of the methodology was deciding which level to choose for the learning situation. All of them were included in the study, because it was not possible to make a separation between associate, bachelor's, master's, and doctorate degrees, and the awareness arises for students at all levels. After this stage, it was necessary to answer three important questions: First of all, how many of the 61 universities in Istanbul would be included in the research? Second, would a choice be made between state and foundation universities? Third, what percentage of the sample would be selected from the total number of students studying in Istanbul? In this context, choosing a representation of two per thousand as a sample was sufficient to conduct research with a solid and accurate design. Statistical data was very important at this stage. The total number of students studying an associate degree, bachelor's degree, master's degree, and a doctorate in morning classes,

night classes, distance education, and open education types in Turkiye is 8.240.997. Out of this number, 3.241.071 is morning classes, 560.223 is night classes, 80.669 is distance education, and 4.359.034 is open education. The total number of students studying an associate degree, bachelor's degree, master's degree, and a doctorate in morning classes, night classes, distance education, and open education types in Istanbul is 1.288.707. Out of this number, 746.907 is morning classes, 55.224 is night classes, 21.545 is distance education, and 465.031 is open education. Considering the criteria selected as the sample within the scope of the research, it was decided to form the research population of 1.604 students out of a total of 802,131 students in morning and night classes at universities in Istanbul, with a ratio of two per thousand. After the sample selection of the study was clarified, the research question and the questionnaire form that constituted the backbone of an empirical study needed to be clarified.

In this study, the following research question was set out to determine the methods by which distance education applications are carried out in universities in Turkiye and to determine to what extent university students, who are in the most critical part of this process, benefit from these applications and obtain efficiency.

Research question: "How much do university students benefit from distance education applications created by the pandemic process and what is the level of efficiency?"

In this framework, a questionnaire form was created to obtain quantitative data and to evaluate the analysis process on a meaningful whole. The questionnaire to be applied was structured on the extent to which university students benefited from distance education applications, the problems they encountered, and the efficiency they achieved. Thus, in accordance with the purpose of the study, it was possible to make meaningful, valid, and reliable determinations about the level of efficiency achieved in the distance education process.

The questionnaire form, which was created within the scope of the study and applied to students through face-to-face interviews, contains two parts. In the first part, demographic factors such as gender, age, type of education, and educational status were examined. In the second part, 57 propositions including the statements about the level of efficienty received by the students during the distance education process were included. The propositions were divided into groups to be consistent within themselves and 6 different scales were created. "Efficiency, Educator-Student Relationship, Social Life, Distance Education, Individual Attitude and Behavior, and finally Technical Processes". While preparing the questionnaire, the second part was coded as "1. Strongly Disagree, 2. Disagree, 3. Undecided, 4. Agree, 5. Totally Agree" based on a five-point Likert type scale. The data obtained were analyzed under the purpose of the study, evaluated in the findings section, and discussed in the conclusion section.

FINDINGS

Findings and Evaluation of Study

Frequency Analysis of Demographic Variables

The distribution of the data collected within the scope of the research by gender is seen in Table 1:

Table 1. Frequency analysis results by gender

Value	Frequency	Percentage
Women	763	47.6
Men	841	52.4
Total	1604	100.0

While 47.6% (n=763) of 1604 people participating in the study were female, 52.4% (n=841) were male. The fact that the gender distribution ratio of the participants is close to each other is important in terms of examining the results from a more scientific perspective. Within the scope of the research, the sample was created in the same way, because the gender distribution in Turkiye is half. Although the sample was created in the same way, there was a small deviation in the application phase in a way that would not cause any problems in terms of validity and reliability, depending on the pandemic conditions.

Table 2. Frequency analysis results by different age groups

Value	Frequency	Percentage
18-24	1420	88.5
25-34	174	10.8
35-44	9	0.6
45-54	1	0.1
Total	1604	100.0

As could be observed in Table 2, 88.5% (n=1420) of the participants are in the age rance of 18-24, 10.8% (n=174) are in the 25-34, 0.6% (n=142) =9 are in the 35-44, and 0.1% (n=1) are in the 45-54. The fact that a significant majority of the participants are in between the ages of 18-24 could be considered normal when the general average age to receive education at the bachelor's degree is evaluated. However, the fact that there are 9 people in the 35-44 age range and 1 person in the 45-54 age range in the sample group of 1604 participants poses difficulties when it comes to obtaining a meaningful result for these age ranges.

Table 3. Frequency analysis results by education type

Value	Frequency	Percentage
Morning classes	1490	92.9
Night classes	114	7.1
Total	1604	100.0

As can be seen in Table 3, 92.9% (n=1490) of the participants are in morning classes and 7.1% (n=114) are in night classes. It can be considered as a result in a way that almost exactly complies with the detailed statistical study determined while creating the sample of the research.

Table 4. Frequency analysis results by education status

Value	Frequency	Percentage
Foundation degree students	193	12.0
Bachelor's degree students	1107	69.0
Master's degree students	219	13.7
Doctoral degree students	85	5.3
Total	1604	100.0

As shown in Table 4, 12% (n=193) of the students participatng in the survey are foundational degree students, 69% (n=1107) are bachelor's, 13.7% (n=219) are master's and 5.3% (n=85) are doctoral students. In the same way, it could be evaluated as a result in a way that almost exactly complies with the detailed statistical study determined while creating the sample of the research.

Table 5. Frequency analysis results by working status

Value	Frequency	Percentage
Yes	1306	81.4
No	298	18.6
Total	1604	100.0

According to the findings, it is seen that 81.4% (n=1306) of the participants are working and 18.6% (n=298) of them are not working. The fact that more than 80% of the participants are students and working at the

same time is quite remarkable. It is possible to say that this result is intriguing in the context of examining how the pandemic period affects the working situation of the student.

Reliability Analysis

In the study, Cronbach's Alpha value was calculated to determine the reliability of the questionnaire created with the "Likert Type Scale". Reliability is expressed as the fact that the findings/results of the scale or tests used to determine the phenomenon regarding the conceptual structure. On the other hand, it expresses the results that reveal a relationship when it is performed with the measurement tool on different samples and with different sample masses taken from the same or similar population (Sencan, 2005, p. 8). Cronbach's Alpha coefficient is frequently used in the Likert-type scale and is accepted as an indicator of the internal consistency of the propositions. Cronbach's Alpha coefficient aims to reveal the results regarding the homogeneous structure of these propositions (Yildiz & Uzunsakal, 2018, p. 19). Although there are different classifications for the interpretation of the Cronbach's Alpha coefficient when the literature is searched, the following classification is generally accepted (Ozdamar, 2002, as cited in Kilic, 2016, p. 47-48):

$0.81<a<1.00$; the scale is highly reliable.

$0.61<a<0.80$; the scale has medium reliability.

$0.41<a<0.60$; the scale has low reliability.

$0.00<a<0.40$; scale is unreliable.

In light of the above information, the Cronbach's Alpha 'reliability' values of the questionnaire prepared for the study resulted as follows:

Table 6. Reliability analysis results

Value	Frequency	Percentage
Efficiency	0.686	16
Educator-Student Relationship	0.236	4
Social Life	0.185	4
Distance Learning	0.443	6
Individual Attitude and Behavior	0.571	24
Technical Processes	0.415	3
Total	0.811	57

Considering the reliability analysis of the research, as indicated in Table 6, Cronbach's Alpha value of the "Efficiency" variable is 0.686 and it has a reliable value. When the remaining five variables are analyzed alone, they do not give a highly reliable result because Cronbach's Alpha values are lower than 0.60. However, the main value to consider is the value of all the variables. In this context, when the total reliability value of the variables are analyzed, it is seen that Cronbach's Alpha value is 0.811, and it is concluded that a "highly reliable" result is obtained.

Other Analysis Related to the Research

Independent sample t-test results of the study

In order to see whether the chance factor is effective in the analysis results of the research, some standard differences were used. In this context, the 5% level (P=0.05) was considered the limit. Looking at the results obtained, it has been discussed by commenting on whether there was a significant difference according to whether the P value was less than or greater than 0.05 (Spiegelhalter, 2010). That is, if the P value is less than 0.05, there is a significant difference, which reduces the probability of such differences being by chance below 1/20. As a result, it is concluded that the difference is statistically significant.

Table 7 below, contains the results of the Independent Sample T-Test, which was conducted to determine whether the efficiency achieved in the distance education process during the pandemic period created a significant difference according to gendeer.

Table 7. Independent Sample T-Test results of efficiency obtained in distance education in terms of participants' gender

Expression	Gender	N	AO	Sig.	P
Efficiency	Women	763	3.22	0.049	**0.112**
	Men	841	3.26		**0.111**

When the results were examined, it was observed that there was no statistically significant difference since the P value was greater than 0.05 (P=0.112 and P=0.111). For this reason, the efficiency of the education-teaching process during the pandemic period does not differ in terms of male students or female students. Gender difference does not affect the efficiency of the education given during the pandemic period.

Table 8. One-Way Anova Test results of obtained efficiency in terms of age ranges of participants

Groups	N	AO	SS	F	P
18-24	1420	3.23	0.538		
25-34	174	3.27	0.539		
35-44	9	3.66	0.367	2.197	**0.087**
45-54	1	2.88	-		
55 and above	0	-	-		
Total	1604	3.24	0.538		

The One-Way Anova (One-Way Analysis of Variance) test, which is one of the parametric tests, was also used to analyze the data in the study. This test was used to assess whether there was a significant difference between more than two independent groups of the tested variable. In this context, when the results were examined, it was observed that there was no significant difference between the age ranges and the efficiency achieved by the participants in distance education during the pandemic period since the P value was greater than 0.05 (P=0.087). Therefore, it is concluded that the efficiency achieved by the participants in distance education during the pandemic period does not make a significant difference in terms of age ranges.

Table 9. Independent Sample T-Test results of obtained efficiency in terms of participants' types of teaching

Expression	Education Type	N	AO	Sig.	P
Efficiency	Morning Classes	1490	3.23	0.232	**0.014**
	Night Classes	114	3.37		**0.056**

According to the results of the analysis, it was observed that there was a statistically significant difference since the P value was less than 0.05 (P=0.014 and P=0.056). For this reason, the efficiency achieved by the participants in distance education during the pandemic period shows a significant difference in terms of learning types. The fact that students studying at primary education and night classes levels applied/arranged processes such as social life, working status, and time management according to the type of education may have led to this result. The specified 0.05 criterion can be tolerated up to 0.059. In other words, it would not be wrong to interpret that there is a significant difference even if the result reached up to 0.059 (Guris & Astar, 2019).

Table 10. One-Way Anova Test results of obtained efficiency in terms of participants' educational status

Groups	N	AO	SS	F	P
Foundation degree students	193	3.32	0.618		
Bachelor's degree students	1107	3.21	0.514		
Master's degree students	219	3.34	0.568	5.610	**0.001**
Doctoral degree students	85	3.20	0.524		
Total	1604	3.24	0.538		

According to the results, it was observed that there was a significant difference between the efficiency of the participants in distance education during the pandemic period and their educational status since the P value was less than 0.05 (P=0.001). The difference between which groups is shown in Table 11 below:

Table 11. Tukey Test results of obtained efficiency in terms of educational status of participants

Groups		Difference in Averages	P
	Bachelor's degree	0.109*	0.045
Associate degree	Master's degree	-0.208	0.954
	Doctoral degree	0.118	0.000
	Associate degree	-0.109*	0.045
Bachelor's degree	Master's degree	-0.137*	0.003
	Doctoral degree	0.009	0.999
	Associate degree	0.028	0.954
Master's degree	Bachelor's degree	0.137*	0.003
	Doctoral degree	0.145	0.146
	Associate degree	-0.118	0.329
Doctoral degree	Bachelor's degree	0.009	0.999
	Master's degree	-0.145	0.146

The data was analyzed, for "Associate Degree" distance education in the condition of their efficiency in the period of the pandemic, with participants in the "Bachelor" education level of respondents pandemic period, and there is a significant difference between distance education in their efficiency. Similarly, a conclusion has been reached that there was a significant difference between the participants at the "Bachelor's" education level and the participants at the "Master's" education level. Based on this finding, it is seen that the efficiency of the participants in distance education during the pandemic period differs depending on the level of education level in terms of their educational status.

Table 12. *Independent Sample T-Test results of obtained efficiency in terms of participants' working status*

Expression	**Working Status**	**N**	**AO**	**Sig.**	**P**
Efficiency	Yes	1306	3.23	0.588	**0.081**
	No	298	3.29		**0.081**

According to the results, it was observed that there was no statistically significant difference since the P value was greater than 0.05 (P=0.081). During the pandemic period, there have been significant changes in people's working patterns and methods. The result obtained may not have been associated with distance education by the participants when the effects of the pandemic period were evaluated.

Regression analysis results of the study

Regression analysis attempts to relate variation in a response variable to one or more explanatory variables, and in regression analysis, the statistical significance of the explanatory variable is tested using the mean square. This estimate is used to calculate the standard error of the effect of each explanatory variable (Galway, 2006, p. IX). In other words, this analysis is used to measure the effectiveness of the value of one variable on the value of another variable. The variable to be predicted is called the dependent variable. The variable used to estimate the value of the other variable is called the independent variable. Within the scope of the study, the effect of distance education, on student efficiency was examined. Table 13 below shows the results of the regression analysis to measure this effect:

Table 13. The effect of distance education process on efficiency

Model Summary[b]				
Model	R	R^2	Adjusted R^2	Standard Error of the Estimate
1	**0.624[a]**	**0.389**	0.388	0.420
a: Estimators: (Constant), Distance Education Process				
b: The Dependent Variable: Efficiency				

ANOVA[a]					
Model	Sum of Squares	df	Square Average	F	Sig.
1 Regression	180.159	1	180.159	1019.085	**0.000[b]**
Leftovers	283.209	1602	0.177		
Total	463.368	1603			
a: The Dependent Variable: Efficiency					
b: Estimators: (Constant), Distance Education Process					

Coefficients					
Model	Non-Standardized Coefficients		Standardized Coefficients	T	P
	B	Standard Error	Beta		
1 (Constant)	1.714	0.049	0.624	35.065	**0.000**
Distance Education Process	**0.497**	0.016		31.923	**0.000**
a: The Dependent Variable: Efficiency					

When the results in Table 13 are examined, it is seen that the P-value contained in the data in the model, which predicts that the distance education process has an impact on efficiency, is statistically significant since it is less than 0.05 (P=0.000). From the results obtained, the coefficient of determination of the model belonging to the efficiency variable of the distance education process is (R^2=0.389) and the distance education process explains approximately 39% of the efficiency. In addition, as can be seen in the table, it was determined that the distance education process variable had a positive effect on the efficiency variable. Thus, every 1 unit increase in the distance education process increases the efficiency by 0.497 units. Based on these results, it is seen that the distance education process has a significant effect on efficiency.

Table 14. The effect of the educator-student relationship on efficiency

Model Summaryb				
Model	R	R^2	Adjusted R^2	Standard Error of the Estimate
1	**0.433**[a]	**0.187**	0.187	0.485
a: Estimators: (Constant), Educator-Student Relationship				
b: The Dependent Variable: Efficiency				

ANOVAa					
Model	Sum of Squares	Df	Square Average	F	Sig.
1 Regression	86.679	1	86.679	368.634	**0.000**[b]
Leftovers	376.688	1602	0.235		
Total	463.368	1603			
a: The Dependent Variable: Efficiency					
b: Estimators: (Constant), Educator-Student Relationship					

Coefficients					
Model	Non-Standardized Coefficients		Standardized Coefficients	T	P
	B	Standard Error	Beta		
1 (Constant)	2.241	0.053	0.433	42.003	**0.000**
Educator-Student Relationship	**0.318**	0.017		19.200	**0.000**
a: The Dependent Variable: Efficiency					

According to the data, the P-value contained in the data in the model, which predicts that the educator-student relationship has an impact on efficiency, is statistically significant because it is less than 0.05 (P=0.000). From the results obtained, the coefficient of certainty of the model belonging to the efficiency variable of the educator-student relationship is (R^2=0.187), and the educator-student relationship explains approximately 19% of the efficiency. In addition, as seen in the table, it was determined that the educator-student relationship variable had a positive effect on the efficiency variable. Thus, every 1 unit increase in the educator-student relationship increases the efficiency by 0.318 units. Based on these results, it is seen that the educator-student relationship has a significant effect on efficiency.

Table 15. The effect of social life on efficiency

Model Summary[b]				
Model	R	R^2	Adjusted R^2	Standard Error of the Estimate
1	**0.019**[a]	**0.000**	0.000	0.538
a: Estimators: (Constant), Social Life				
b: The Dependent Variable: Efficiency				

ANOVA[a]					
Model	Sum of Squares	Df	Square Average	F	Sig.
1 Regression	0.167	1	0.167	0.576	**0.448**[b]
Leftovers	463.201	1602	0.289		
Total	463.368	1603			
a: The Dependent Variable: Efficiency					
b: Estimators: (Constant), Social Life					

Coefficients					
Model	Non-Standardized Coefficients		Standardized Coefficients	T	P
	B	Standard Error	Beta		
1 (Constant)	3.281	0.058	-0.019	56.799	**0.000**
Social Life	**-0.013**	0.018		-0.759	**0.448**
a: The Dependent Variable: Efficiency					

When the results are examined, it is seen that the P-value contained in the data in the model, which predicts that social life affects efficiency, is not statistically significant due to the fact that it is greater than 0.05 (P=0.448). From the results obtained, the coefficient of certainty of the model belonging to the efficiency variable of social life is (R^2=0.000) and thus social life does not explain efficiency. In this context, it is seen that social life does not have a significant effect on efficiency.

Table 16. The effect of individual attitudes and behaviors of students on efficiency in distance education process

Model Summary[b]				
Model	R	R^2	Adjusted R^2	Standard Error of the Estimate
1	**0.621**[a]	**0.386**	0.385	0.422
a: Estimators: (Constant), Individual Attitude and Behavior				
b: The Dependent Variable: Efficiency				

ANOVA[a]					
Model	Sum of Squares	Df	Square Average	F	Sig.
1 Regression	178.674	1	178.674	1005.419	**0.000**[b]
Leftovers	384.693	1602	0.178		
Total	463.368	1603			
a: The Dependent Variable: Efficiency					
b: Estimators: (Constant), Individual Attitude and Behavior					

Coefficients					
Model	Non-Standardized Coefficients		Standardized Coefficients	T	p
	B	Standard Error	Beta		
1 (Constant)	0.781	0.078	0.621	9.981	**0.000**
Individual Attitude and Behavior	**0.802**	0.025		31.708	**0.000**
a: The Dependent Variable: Efficiency					

When the results are examined, it is seen that the P-value in the data in the model, which predicts that the individual attitudes and behaviors of the students in the distance education process affect efficiency, is statistically significant since the P value is less than 0.05 (P=0.000). According to the results obtained, the coefficient of determination of the model belonging to the efficiency variable of individual attitudes and behaviors of students in the distance education process is (R^2=0.386). In addition, as can be seen in the table, as can be derived from the data in the table, the individual attitudes and behaviors of the students in the distance education process had a positive effect on the efficiency variable. Thus, every 1 unit increase in the individual attitudes and behaviors of the students in the distance education process increases the efficiency by 0.802 units. Based on these results, it is seen that the individual attitudes and behaviors of the students in the distance education process have a significant effect on efficiency.

Table 17. The effect of technical processes encountered by students in the distance education process on efficiency

Model Summary[b]				
Model	R	R^2	Adjusted R^2	Standard Error of the Estimate
1	**0.421[a]**	**0.177**	0.177	0.488
a: Estimators: (Constant), Technical Processes				
b: The Dependent Variable: Efficiency				

ANOVA[a]					
Model	Sum of Squares	Df	Square Average	F	Sig.
1 Regression	82.067	1	82.067	344.797	**0.001[b]**
Leftovers	381.301	1602	0.238		
Total	468.368	1603			
a: The Dependent Variable: Efficiency					
b: Estimators: (Constant), Technical Processes					

Coefficients					
Model	Non-Standardized Coefficients		Standardized Coefficients	T	p
	B	Standard Error	Beta		
1 (Constant)	2.486	0.042	0.421	58.780	**0.000**
Technical Processes	**0.249**	0.013		18.569	**0.000**
a: The Dependent Variable: Efficiency					

According to the results of the analysis, it is statistically significant since the P-value in the data in the model, which predicts that the technical processes that students encounter during the distance education process affect efficiency, is less than 0.05 (P=0.000). From the results obtained, the coefficient of certainty of the model belonging to the efficiency variable of the technical processes encountered by the students in the distance education process is (R^2=0.177). In addition, as can be seen in the table, that the variable of technical processes encountered by students in the distance education process has a positive effect on the efficiency variable. Thus, every 1 unit increase in the technical processes faced by students in the distance education process increases efficiency by 0.249 units. Based on these results, it is seen that the technical processes faced by students in the distance education process have a significant effect on efficiency. It can also be said that the technical problems/inadequacies that may be encountered in computational and hardware structures such as the Internet, computers, audio and video systems may have harmed the efficiency level of distance education. In addition, the problems that may be encountered with the education systems of universities may increase the effect of this negative situation. If the aforementioned negativities are the opposite, it can be thought that the distance education process can be more productive and have a more instructive effect on the students.

DISCUSSIONS AND CONCLUSION

It is undeniable that education is the main actor as the only way out of all the destruction, despair, wounds, and falls created by the pandemic period. In this context, this study examined the three semester period that has passed since the beginning of the pandemiv period in higher education institutions in Turkiye, and where this process was positioned in terms of efficiency. Firstly, this study aimed to provide comprehensive preliminary research, in-depth reviews of the literature to reveal a methodology with strengthened validity and reliability, and to obtain data from the field. Then, after the analysis of the research findings being completed, creating new perspectives would be evaluated in way allowing a different ground to be established. Finally, suggestions would be made for the process.

When a general evaluation is made in terms of the efficiency obtained by university students from distance education applications, it can be said that it is very difficult to reveal a clear difference such as black and white. It would not be wrong to claim that the existence of a surface covered by mostly gray areas related to the process in question dominates. It is seen that students have a negative idea, especially due to the decrease in the socialization process, the disappearance of mutual interaction, and the feeling of being away from the identity of being a university student. It is observed that, students have a negative idea of being a university

student considering the decrease in the socialization process, the dissapearance of mutual interaction, and the feeling of being from the identity However, it can be seen that they tend to have a positive view in terms of increasing the time they spend for themselves, being able to work in a job outside the university, and bringing the economic parameters to more controllable levels. On the other hand, in this process, some factors enabled students' views on the courses and the efficiency of the courses to reach a more prominent level. These factors can be listed as the methods of controlling the communication processes of academicians, the content of the course, the way the course is taught, the integration of digital factors, and the use of digital resources. For this reason, it is thought that students make evaluations that outweigh the subjective side towards a particular situation through singular examples and experiences, rather than opinions that will enter into a general concept. In addition, it is seen that the thick line between theoretical courses and applied courses has become much more evident in this period. When it is considered in terms of assessment and evaluation methods, it can be said that the idea of 'easy' comes to the fore against the exams and grading system, and therefore the perception of 'passing the course' rather than learning becomes dominant.

It appears that some of the results obtained in the light of the data accessed from the students within the scope of the study will shed light on the future studies, which are listed below:

- Students do not have clear view about whether the lecturer's lesson style is open to mutual interaction in the distance education process.
- The majority of students think that distance education courses are more comfortable compared to face-to-face education.
- The vast majority of students think that they have deficiency in applied courses.
- It is accepted by students that distance education systems are inadequate, ineffective, and create obstacles to practice, especially in practical courses.
- The vast majority of students think that applied courses in distance education are not efficient.
- The opinions of the students about whether they have deficiencies in the theoretical courses or not to have very close ratios to each other. However, students think that they have deficiencies in theoretical courses in the context of the competence of the instructor who gives the course, communication methods and course functioning.
- The majority of students think that it is easy to cheat on exams during the distance education process. That is because the exams were held online, and the necessary precautions could not be taken sufficiently. In addition, the measures taken when it comes to privacy and security were insufficient and this problem could not be avoided. Considering the feedback from students that underlines that cheating is comfortable during the distance education period, it can be said that universities can observe ethical values to a certain extent and cannot prevent cheating.
- The majority of the students think that the trust between the educator and the student is not strengthened during the distance education. In the distance education process, unlike face-to-face education, the social and direct communication between the educator and the student has been interrupted.
- According to the data obtained, the vast majority of students are not interested in completely switching to distance education practice in the ongoing process.
- Students think that course registrations during the distance education process help them prepare for the exam. Moreover, this result was one of the approaches in which the highest rate of positive opinion was expressed among the answers given to all propositions.
- The majority of the students stated that they were undecided about finding the opportunity to put the applied lessons into practice during the distance education process.

In short, this study is long-term and is important in the context of melting many different components together in the same pot. As a result of the study, suggestions for increasing efficiency and creating a more qualified education culture in the distance education process, which can also be considered as the manifest of the study, are given below:

- Institutional investment to strengthen the technical infrastructure, especially to increase the speed of internet data flow
- Creation of a coordinated integration fort he use of different digital platforms instead of the necessity of using a centralized system, based on the fact that the priority is to increase the quality of educational activities.
- Application of the audit and control mechanism with a majoritarian understanding within the framework of ethical values for the course functioning processes
- Consideration of examination methods, grading styles, and course passing criteria together with the function of 'learning' and institutional effort to internalize the responsibility that should come to the fore
- In the context of cooperation between universities, the establishment of universal principles based on knowledge and in which the understanding of 'we' stand out decisively.
- To reveal more clearly that distance education practices are different from face-to-face education methods and to create a comprehensive education program in terms of creating digital content
- Carrying out studies for the institutionalization of ethical principles for both academic and administrative staff and students and creating a more functional and multi-participatory strategy for the establishment of the legal infrastructure
- Developing systems that are more applicable in terms of theoretical courses and applied to courses and that will increase students' awareness of the course
- Revising the course contents in a way that is suitable for mutual interaction in the courses
- Internalization of the requirements and competencies of the digital world will be formed much more efficiently not by creating a culture of the objection, but by spreading the culture of discussion to the grassroots
- Finally, with the awareness of the difficulty of creating the advantages and aura of the social environment created by face-to-face education in distance education, maximum effort should be made towards multidimensional and multi-layered implementation to establish an integrative culture instead of being exclusive

Acknowledgements: We would like to thank Istanbul Topkapi University for providing all kinds of contributions to the project titled "Educational Methods and Productivity Research in Universities During the Pandemic Process", in which the study was produced.

Authors' Note: This study was supported within the scope of Istanbul Topkapi University Scientific Research Projects. This research was carried out with the permission of Istanbul Topkapi University Academic Research and Publication Ethics Committee with the decision dated 23/09/2021 and numbered 2021/08.

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TEACHERS' OPINIONS ON TECHNOLOGY LEADERSHIP ROLES OF SCHOOL PRINCIPALS DURING THE COVID-19 PANDEMIC

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Received: 01/06/2023 **Accepted:** 27/07/2023

ABSTRACT

The main purpose of this study is to examine the opinions of teachers about technology leadership roles of school principals during the Covid-19 pandemic. The study, which utilized qualitative research methods, was designed as a survey study. Sample group of the study constituted of 259 teachers. Data of the study was collected with "Elementary School Principals' Technology Leadership Role Scale" and analyzed via descriptive statistics, independent sample t-test, one-way ANOVA and Mann Whitney-U test. According to the results, both elementary school teachers and subject matter teachers think that school principals successfully demonstrated the role of technology leadership roles during the Covid-19 pandemic. As a result of the analyses conducted to determine whether teachers' opinions vary according to various variables, it was concluded that there are no differences in terms of the entire scale and its dimensions based on genders and seniority of teachers. In terms of the working domain, it was seen the opinions of elementary school teachers on vision dimension are higher than those of subject matter teachers. Based on the results, some recommendations which can contribute to both implementation and theory have been developed. Accordingly, conducing researches which employ multiple data collection methods and tools to investigate technology leadership roles of school principals is considered important.

Keywords: Technology leadership, school principals, Covid-19 pandemic.

INTRODUCTION

Technology, which has become a sine qua non for the 21st century, is in continuous and mutual interaction process with various fields such as art, science, health, culture, and education. Education, as one of these fields, both constitutes the source of technological advancements and is transformed under the effect of technology (OECD, 2019; Selwyn and Facer, 2014). Technology, fundamentally rooted in the Greek language, is composed of the syllables "tekhne," meaning craftsmanship, and "logia," referring to knowledge (Tulley, 2008). Technology is seen as an entity which integrates knowledge, skills, methods, techniques, and which are utilized by human beings to achieve their goals rooted from their interests, needs, and desires.

While these tools and processes are utilized to modify and transform the environment, the changes and transformations occurring in the environment necessitate the continuous renewal of technological tools and processes. Thus, technology itself inevitably becomes a constant state of transformation.

The purpose of technology usage is to facilitate human life. Individuals who lead this facilitation process are generally "leaders," and more specifically "technology leaders". Leadership behaviors performed by these leaders are called as technological leadership (Anderson & Dexter, 2005; Flanangan & Jacobsen, 2003; Fletcher, 2009). Yee (2000) states that technological leadership is alike to transformative leadership in terms of its characteristics. Therefore, it is possible to say that the technological leadership is arisen from the motivation of anticipating and utilizing changes and transformations for the benefit of the organization. Technological leadership refers to the leadership roles exhibited by leaders who enable both their followers and themselves to benefit from technology while directing these followers' potential to the common good of the organization (Can, 2003). Considering this definition and explanations about technology leadership, it becomes apparent that only using digital technologies effectively in daily life is not sufficient for individuals taking on the role of technology leadership. Accordingly, it is possible to assert that technology leadership includes the ability to integrate technology with all organizational processes and it also includes such behaviors as motivating and guiding other members of the organization in utilizing technology in these processes.

Due to the integrated nature of technology with everyday life, it gains increasing importance for all social institutions and it inevitably becomes a significant part of teaching and learning processes (Chang, Chin, & Hsu, 2008). Particularly, the necessities brought by Covid-19 pandemic, the effects of which have been strongly felt worldwide, have led to a period through which education is predominantly carried out with the help of technology. The report published by World Bank (2020) on school closures during the Covid-19 period highlights that schools in 180 countries had to close during this period. Going through such a period has demonstrated that keeping up with technology has transitioned from being an alternative educational approach to a necessity (Deniz & Teke, 2020). While this period has turned the school into technology, it has also emphasized the importance of utilizing technological resources at the highest level in order to establish and maintain an effective teaching and learning process.

Technology-driven transformations happening today support the notion that the life is evolving towards a technology dependent future (Raja & Nagasubramani, 2018). The institutions which are responsible for training people who will participate in constructing such a future or can survive in such a future are schools (OECD, 2018). So, school administrators are expected to have technological competencies to ensure that these schools can integrate technology with education (Mok & Moore, 2019; Karakose, Polat ve Papadakis, 2021). Athough schools now need technology leaders more than before, there still are some factors that limit the technology leadership of school administrators. Among these factors, the inadequacy of technology education, bureaucratic structures, and limited resources are particularly notable (Flanagan & Jacobsen, 2003; Leonard & Leonard, 2006; Sincar, 2013). Nevertheless, in recent years, the dominance of a technology-focused way of life and the increased accessibility of technology both have eliminated these limitations and have made technology leadership one of the priorities in the professional development of school administrators.

Schools with administrators who easily value innovative technologies and support the effective usage of these technologies in the teaching and learning processes will have an easier adaptation to technology, which is seen as an anticipated outcome. Yet, it is a known fact that a value or a norm that school administrators do not prioritize will not easily penetrate the school, while the values and norms they prioritize can easily spread within the school (Simsek, 2005). School administrators who believe that the technology will determine the quality of education are responsible for creating technological learning environments are expected to develop themselves in this regard (Sisman-Eren, 2010). The inclination of administrators towards technological development, their sensitivity and openness to development, inevitably influence the school personnel directly or indirectly over time. In schools, administrators are the individuals that teachers see as role models and want to get their support. This situation clearly demonstrates the importance of the technology leadership roles of school administrators not only for the development of students and the improvement of teaching but also for the professional development of teachers.

Technology leadership of school administrators is considered an important tool for the success and effectiveness of a school. This is also accepted as a sign of managerial competencies of the school administrator (Chang and Tseng, 2005; Dexter, 2011; Flanagan and Jacobsen, 2003). The development of information and internet technologies, which have gained momentum especially with the Covid-19 pandemic in recent years, has influenced many stakeholders of the school, including teachers, students, and administrators. The increase in actions and efforts such as leveraging effective technology usage in educational institutions necessitate school administrators performing their technology leadership roles effectively. Technology leadership represents the decisions, policies, and actions that facilitate the efficient use of information technology throughout educational organizations (Anderson and Dexter, 2005). When examining the fundamental dimensions that constitute technology leadership, it is clearly seen technology leadership encompasses all elements of the school. These dimensions are identified by Sincar (2009) as human-centeredness, vision, communication and collaboration, and support. Human-centeredness refers to adopting an approach that prioritizes the interests and needs of school stakeholders when integrating technology into the school. Vision means school administrators' having a future vision in which the school is integrated with technology. The dimension of communication and collaboration is explained as engaging stakeholders in open communication and establishing a technology-focused communication network. Finally, the support dimension is summarized as encouraging school stakeholders to acquire technology usage habits and facilitating their access to technology.

Remote learning, digital communication, and internet-based technologies have gained significant importance in education with the Covid-19 pandemic. The pandemic, which led to partial and fully school closures in many countries including Turkiye, necessitated rapid adaptation to technological tools and processes in schools (UNESCO, 2021). All stakeholders of educational processes, regardless of their readiness level, have found themselves involved in distance learning activities since that time. Consequently, one of the main actors of this digital transition period has been school administrators even if they have not volunteered (AlAjmi, 2022). Schools whose administrators effectively use technology, communicate with parents, teachers, and students through social media and other tools during remote or hybrid education processes are one step ahead. These have made the technology usage level of a school an important criterion for the effectiveness (Dare & Saleem, 2022; Karakose, Polat & Papadakis, 2021).

The Covid-19 pandemic, which caused prolonged school closures and digital based educational processes, has functioned as a test for the quality of education in a sense. Research conducted during this process has revealed that administrators with better technological and digital competencies have managed this process more effectively (AlAjmi, 2022; Antanopoulou et al., 2021; Hamzah, Nasir, & Wahab, 2021; Karakose, Polat, & Papadakis, 2021). In this regard, it is expected that studies highlighting the technological leadership capabilities of school administrators will contribute to the improvement of current practices. Assessing the abilities of school administrators to use technology and integrate it into school management processes has the potential to identify areas in need of development. Additionally, such studies are believed to provide guidance in processes such as the training, selection, and evaluation of school administrators. Indeed, there are numerous studies focusing on the characteristics of school administrators within the scope of technology leadership in the literature (Anderson & Dexter, 2005; Banoglu, 2011; Chang, 2012; Hacifazlioglu, Karadeniz, & Dalgic, 2011; Sincar, 2009; Sincar, 2013; Weng & Tang, 2014; Zhong, 2017). However, Covid-19 pandemic which necessitated transition to distance education for a prolonged time period, made the direct observation of the technological leadership competencies of school administrators possible especially for teachers. Teachers had the chance to observe the strengths and weaknesses of school administrators during this period. In this context, one of the distinctive features of this study which has been conducted to examine the technological leadership roles performed by school administrators during the Covid-19 pandemic, is making this examination by taking the opinions of teachers who have been the closest observers of school administrators and have been affected from school administrators' decisions more than any other school stakeholder. In this framework this study is expected to serve as a guide in the professional development of school administrators by identifying the areas need to be developed and open to improvement based on its findings.

PURPOSE OF THE STUDY

The main purpose of this study is to examine teachers' opinions on the technological leadership roles performed by school administrators during the Covid-19 pandemic in terms of various variables. To achieve the main purpose of the study, following research questions were addressed:

1. What are the opinions of classroom teachers regarding the technological leadership role of school administrators?
2. What are the opinions of branch teachers regarding the technological leadership role of school administrators?
3. Are there statistically significant differences among the views of teachers regarding to the technological leadership roles of school administrators in terms of teachers' gender, branches and seniorities?

METHOD

The study is designed with survey research model which is one the research models of quantitative research method. The survey model is generally used to define attitudes or opinions of a population by describing it wit numeric data (Creswell, 2014). It allows researchers to collect a large amount of data to make generalizations (Cohen, Manion & Morrison, 2005). Based on this advantage of survey model, it was used for this study which aims to investigate teachers' opinions on the technology leadership roles of school administrators performed during the Covid-19 period.

Participants

The study population of this research consisted of 545 teachers working in elementary and secondary schools located in Karacabey, Bursa. Simple random sampling method which ensures equal probabilities for each individual to be selected from the population to the sample group (Buyukozturk et al., 2018; Hsu, 1989) was preferred to determine individuals who were included in the sample. Accordingly, 122 teachers from 6 elementary schools and 137 teachers from 7 secondary schools were selected through simple random sampling. Thus, 259 teachers were included in the sampling. Demographic information regarding these teachers is presented in Table 1.

Table 1. Demographic information about the sample group

Variables	Category	n	%
Cinsiyet	Male	131	50,6
	Female	128	49,4
Branch	Classrom Teacher	85	32,8
	Branch Teacher	174	67,2
Seniortiy	1-5 years	17	6,6
	6-10 years	58	22,4
	11-15 years	79	30,5
	16-20 years	55	21,2
	21 years and more	50	19,3
	Total	**259**	**100,0**

As can be seen in Table 1, 49.4% of the teachers are female, while 50.6% are male. Among them, 32.8% are classroom teachers, and 67.2% are branch teachers. In terms of teaching experience, 6.6% of them have 1 to 5 years of experience, 22.4%of them have 6 to 10 years, 30.5% of them have 11 to 15 years, 21.2% of them have 16 to 20 years, and 19.3% of them have 21 years and above of professional experience.

Data Collection and Analysis

Before proceeding with the analysis, the distribution of the data was examined to determine the appropriate analysis techniques. In order to analyze whether the data exhibited a normal distribution, skewness and kurtosis coefficients were examined, and the results are presented in Table 2.

Table 2. Descriptive statistical values obtained from the scale

	Skewness		Curtosis	
Variables	Value	SE	Value	SE
Human-centeredness	-0,73	0,15	0,35	0,30
Vision	-0,49	0,15	-0,27	0,30
Communication and collaboration	-0,38	0,15	-0,31	0,30
Support	-0,57	0,15	-0,08	0,30
Total	-0,52	0,15	-0,04	0,30

The data of the respondents who completed the scale were evaluated, and based on this evaluation, it was determined that the skewness and kurtosis values fell between +1 and -1 as seen in Table 2. Therefore, it can be concluded that both the overall scale and its dimensions exhibited a normal distribution of data. (Hair et al., 2014).

Data Collection Tools

The "Primary School Administrators' Technology Leadership Roles Scale" developed by Sincar (2009) was used as the data collection tool in this study with the necessary permissions obtained. The scale consists of 4 dimensions and 29 items and is in a five-point Likert format. Additionally, a "Personal Information Form" was used to determine the participants' demographic characteristics. Ethical committee approval was taken from Anadolu University Ethical Committee for conducting the research (Date: 28.01.2022, Decision No: 259017).

The 4-factor scale structure of "Scale of Technology Leadership Roles of Primary School Administrators" which was resulted from the exploratory factor analysis (EFA) was tested with confirmatory factor analysis (CFA) within the scope of this study to enhance the validity of the findings. The purpose of using confirmatory factor analysis was to demonstrate the fit between the items and dimensions in the scale, which had a pre-determined factor structure, with data. In this regard, it was necessary to conduct this analysis to determine whether the 4-dimensional structure of the scale, developed through studies conducted on different samples, was confirmed for the sample of this study.

To determine the construct validity of the scale, confirmatory factor analysis was conducted using the Jamovi 2.2.5 program developed by Jamovi.org. In the confirmatory factor analysis, the suitability of the data for factor analysis was first assessed using the Bartlett's sphericity test. According to the results obtained from the Bartlett's sphericity test (Table 3), it can be concluded that the data are has a multivariate normal distribution and factor analysis can be applied to this structure since the p-value is < 0.01.

Table 3. Bartlett's sphericity test

χ^2	df	p
8798	406	<0.001

Another tool which is used to test the suitability of a structure for factor analysis is the Kaiser-Meyer-Olkin (KMO) sampling adequacy test. The KMO results should be greater than 0.50 to accept the data suitable for factor analysis (Guris & Astar, 2015). When the KMO test was applied to the data obtained in this study, it was observed that the sampling adequacy results ranged between 0.921 and 0.989 for each item, and no item was found to be removable from the scale. The average item suitability was found as 0.970 (KMO value) which indicated that the entire set of items was suitable for factor analysis. After these tests, confirmatory factor analysis (CFA) was performed. In this analysis, the χ^2/df value was examined first. It is stated in the literature that a value below 5 is indicative of an acceptable fit (Sumer, 2000). In this regard, the χ^2/df value obtained from this study (1293/371 = 3.485) indicates an acceptable fit. Subsequently, the factor loadings of the obtained data were examined. It was observed that the factor loadings of the scale consisting of 29 items and 4 factors (People-Centeredness, Vision, Communication, and Collaboration with Support) ranged between 0.720 and 0.914. Then the fit indices were examined. Table 4 presents the fit index scores of the scale.

Table 4. Fit indices of the scale

CFI	TLI	SRMR	RMSEA
0.895	0.885	0.042	0.098

As seen in Table 4, commonly preferred fit indices in the literature, which are CF, TLI, RMSEA, and SRMR, were examined to interpret the CFA results. In the literature, it is suggested that CFI and TLI values should be above 0.90 as a criterion for good fit (Hair et al., 2014). In this study, the CFI value was found as 0.895, and the TLI value was found as 0.885. Therefore, it can be said that these values are acceptable. Regarding the SRMR and RMSEA values, the recommendation in the literature is that they should be less than 0.08 (Hair et al., 2014). Accordingly, the obtained SRMR value (0.042) indicates a good fit within the scope of the research. However, concerning the RMSEA value, it was determined that this value exceeded the acceptable threshold. Therefore, in the framework of CFA, modifications were made by creating covariances between items which have high covariances. So, covariances were created between items 19 and 20, and items 22 and 23 based on expert opinions. As a result of these modifications, the χ^2/df value decreased to 2.91, indicating a good fit. The fit indices obtained after the modifications are presented in Table 5.

Table 5. Fit indices after modifications

CFI	TLI	SRMR	RMSEA
0.920	0.912	0.038	0.085

As seen in Table 5, the CFI value increased to 0.920, and the TLI value increased to 0.912, the SRMS value decreased to 0.038, and the RMSEA value decreased to 0.085 after modifications were created. These results indicate an improvement in the fit values of the scale as a result of the modifications. Thus, it is confirmed that the scale is in an acceptable structure for the research sample.

Data Analysis and Interpretation

The data collected from teachers were analyzed with SPSS 22.0 and Jamovi 2.2.5 software packages. Descriptive statistics were calculated to reveal teachers' opinions on school administrators' technology leadership roles. Before examining the relationships between teachers' opinions and demographic variables, the "Levene's test for homogeneity of variances" was initially conducted for each variable. Then, independent sample t-tests and one-way ANOVA (analysis of variance) were utilized to compare the opinions of teachers according to their gender, branch and seniority.

To ensure an objective interpretation of the data, the boundaries of the statements in the 5-point Likert scale were determined. Accordingly, scores below 3.40 were interpreted as "mediocre or in need of improvement in technology leadership," scores between 3.41 and 4.20 were interpreted as "successful technology leadership," and scores between 4.21 and 5.00 were interpreted as "excellent technology leadership."

FINDINGS

In this section, the findings obtained from the research have been presented under three separated headings in line with the research questions. Firstly, the findings revealing the opinions of classroom teachers regarding the technology leadership roles of school administrators are presented, then the findings that reveal the opinions of branch teachers on the technology leadership roles of school administrators are presented. Finally, the findings which reveal whether there are statistically significant differences between teachers' opinions according to genders, branches and seniorities.

The Opinions of Classroom Teachers Regarding the Technology Leadership Roles of School Administrators

The first sub-purpose of this study is to reveal the opinions of classroom teachers regarding the technology leadership roles of school administrators. The data obtained from the technology leadership roles scale which were conducted to the sample were analyzed in terms of the overall scale and its sub-dimensions. Findings are presented in Table 6.

Table 6. Classrom teachers' opinions on technology leadership roles of school administrators

Dimensions	n	$\bar{x}$	ss
Human-centeredness	85	4.00	.09
Vision	85	3.80	.09
Communication and collaboration	85	3.92	.09
Support	85	3.96	.10
Total	85	3.93	.09

It can be observed from the Table 7 that the opinions of classroom teachers regarding the technology leadership roles of school administrators are as follows: The overall mean score ($\bar{x}$) is 3.93, mean score of ($\bar{x}$) "human-centeredness" sub-dimension is 4.00, mean score ($\bar{x}$) of "vision" sub-dimension is 3.80, mean score of ($\bar{x}$) of "communication and collaboration" sub-dimension is 3.92, and mean score of ($\bar{x}$) "support" sub-dimension is 3.96. These findings indicate that classroom teachers evaluate the technology leadership competencies of school administrators high and think that their school administrators have performed technology leadership roles successfully during the Covid-19 pandemic.

The Opinions of Branch Teachers Regarding the Technology Leadership Roles of School Administrators

The second sub-purpose of this study is to reveal the opinions of branch teachers regarding the technology leadership roles of school administrators. The data obtained from the technology leadership roles scale which were conducted to the sample were analyzed in terms of the overall scale and its sub-dimensions. Findings are presented in Table 7.

Table 7. Branch teachers' opinions on technology leadership roles of school administrators

Dimensions	n	$\bar{x}$	ss
Human-centeredness	174	3.87	.06
Vision	174	3.56	.07
Communication and collaboration	174	3.75	.06
Support	174	3.73	.07
Total	174	3.75	.06

It can be observed from the Table 7 that the opinions of branch teachers regarding the technology leadership roles of school administrators are as follows: The overall mean score ($\bar{x}$) is 3.75, mean score of ($\bar{x}$) "human-centeredness" sub-dimension is 3.87, mean score ($\bar{x}$) of "vision" sub-dimension is 3.56, mean score of ($\bar{x}$) of "communication and collaboration" sub-dimension is 3.75, and mean score of ($\bar{x}$) "support" sub-dimension is 3.73. These findings indicate that branch teachers evaluate the technology leadership competencies of school administrators high and think that their school administrators have performed technology leadership roles successfully during the Covid-19 pandemic.

The Opinions of Teachers Regarding the Technology Leadership Roles of School Administrators in Terms of Demographic Variables

The third sub-purpose of this research is to determine the opinions of teachers regarding the technology leadership roles of school administrators based on such demographic variables as gender, branch, and seniority. In this context, firstly, independent sample t-test was conducted to see whether there were significant differences in the opinions of teachers regarding the technology leadership roles of school administrators based on their genders. While reporting and interpreting the results of independent sample t-test, varience homogeneity of the data were controlled with Levene's test. Since Levene's test indicated that the data had not equal variances ($p<.05$), results of t-test in case of equal variances not assumed were reported. The findings are presented in Table 8.

Table 8. Independent sample t-test results for teachers' gender

Variables	Gender	n	$\bar{x}$	ss	T	sd	p
Human-centeredness	Male	131	3.86	.88	-1.066	248.776	.287
	Female	128	3.97	.71			
Vision	Male	131	3.55	1.05	-1.481	245.992	.140
	Female	128	3.73	.83			
Communication and collaboration	Male	131	3.75	.92	-1.052	251.665	.294
	Female	128	3.86	.78			
Support	Male	131	3.75	.98	-.982	252.672	.327
	Female	128	3.86	.84			
Total	Male	131	3.74	.91	-1.229	245.744	.220
	Female	128	3.87	.71			

When Table 8 is examined, it can be observed that there is no statistically significant difference in the opinions of teachers regarding the technology leadership roles of school administrators based on their genders in terms of the overall scale (t=-1.229; p=.220) and the dimensions of the scale which are human-centeredness (t=-1.066; p=.287), vision (t=-1.481; p=.140), communication and collaboration (t=-1.052; p=.294), and support (t=-.982; p=.327). Therefore, it is possible to say that regardless of their genders, all teachers have positive opinions about the technology leadership roles of school administrators.

After the gender variable, opinions of teachers regarding the technology leadership roles of school administrators were compared according to their branches were by using independent sample t-test. While reporting and interpreting the results of independent sample t-test, varience homogeneity of the data were controlled with Levene's test. The results of this test indicated that the data showed homogeneity for the overall scale, the human-centeredness dimension, the communication and collaboration dimension, and the support dimension (p>.05). However, it did not show homogeneity for the vision dimension (p<.05). T-values, sd values and p values were reported according to the results of Levene's test. The findings are presented in Table 9.

Table 9. Independent t-test results for teachers' branches

Variables	Branch	n	$\bar{x}$	ss	t	sd	p
Human-centeredness	Classrom teacher	85	4.00	.81	1.246	257	.214
	Branch teacher	174	3.87	.80			
Vision	Classrom teacher	85	3.80	.87	2.010	183.949	.046
	Branch teacher	174	3.56	.97			
Communication and collaboration	Classrom teacher	85	3.92	.86	1.471	257	.143
	Branch teacher	174	3.75	.84			
Support	Classrom teacher	85	3.96	.88	1.874	257	.062
	Branch teacher	174	3.73	.92			
Total	Classrom teacher	85	3.93	.80	1.685	257	.093
	Branch teacher	174	3.75	.82			

It can be observed from Table 9 that there were no statistically significant differences in teachers' opinions about school administrators' technology leadership roles in terms of the overall scale (t=1.685; p=.093), the human-centeredness dimension (t=1.246; p=.214), the communication and collaboration dimension (t=1.471; p=.143), and the support dimension (t=1.874; p=.062) based on their branches. However, the results showed that there were statistically significant differences in teachers' opinions about school administrators' technology leadership roles in terms of vision dimension (t=1.874; p=.046) based on their branches. When the mean scores of classroom teachers ($\bar{x}$=3.80) and branch teachers ($\bar{x}$=3.56) were examined, it was seen that classroom teachers that classroom teachers perceived school administrators more visionary in the context of technology leadership.

Finally, the investigation of whether there was a significant difference in teachers' opinions on school administrators' technology leadership roles in terms of the overall scale and its sub-dimensions based on the seniority variable was conducted. Prior to conducting the analyses, the homogeneity of the data was examined using the Levene's homogeneity test. Since the results of the Levene's test indicated that the data was distributed homogeneously (p>.05) for both the overall scale and all of its sub-dimensions, the comparisons based on the seniority variable were conducted using one-way analysis of variance (ANOVA) test. The findings are presented in Table 10.

Table 10. One-way ANOVA results for teachers' seniorities

Variables	Seniority	n	$\bar{x}$	ss	F	p
Human-centeredness	1-5 years	17	3.84	.84	.983	.417
	6-10 years	58	3.87	.91		
	11-15 years	79	4.00	.71		
	16-20 years	55	3.77	.79		
	21 and more	50	4.01	.80		
Vision	1-5 years	17	3.55	1.07	.382	.822
	6-10 years	58	3.60	1.04		
	11-15 years	79	3.70	.87		
	16-20 years	55	3.54	.95		
	21 and more	50	3.72	.94		
Communication and collaboration	1-5 years	17	3.66	1.02	.832	.506
	6-10 years	58	3.81	.91		
	11-15 years	79	3.89	.77		
	16-20 years	55	3.65	.83		
	21 and more	50	3.87	.89		
Support	1-5 years	17	3.74	.90	.687	.602
	6-10 years	58	3.79	1.03		
	11-15 years	79	3.90	.83		
	16-20 years	55	3.65	.94		
	21 and more	50	3.86	.88		
Total	1-5 years	17	3.71	0.93	.782	.538
	6-10 years	58	3.78	0.92		
	11-15 years	79	3.89	0.73		
	16-20 years	55	3.67	0.79		
	21 and more	50	3.89	0.82		

When Table 10 is examined, it can be seen that there is no statistically significant differences in teachers' opinions on school administrators' technology leadership roles based on their seniorities in terms of both the overall scale (F=.782; p=.538) and the dimensions of human-centeredness (F=.983; p=.417), vision (F=.382; p=.822), communication and collaboration (F=.832; p=.506), and support (F=.687; p=.602). In this context, it was determined that the seniority of teachers did not have a significant impact on their positive opinioms on school administrators' technology leadership roles.

DISCUSSIONS AND CONCLUSION

In this research, which was conducted to examine to how well school administrators have performed technology leadership roles during the Covid-19 pandemic based on teachers' opinions, firstly the opinions of classrom teachers and secondly opinions of branch teachers are revealed. In this context, firstly, the data obtained from classroom teachers were analyzed. The results indicated that classroom teachers believed that school administrators successfully performed the technology leadership roles during the Covid-19 pandemic. After elementary school teachers, the opinions of subject teachers were examined in line with the second sub-question of the research. As a result of the analysis, it was determined that the opinions of teachers were similar to those of classroom teachers. Accordingly, branch teachers also believed that school administrators successfully performed technology leadership roles during the Covid-19 pandemic. In conclusion, it is possible to make a general inference that teachers have positive opinions about the technology leadership roles performed by of school administrators during the pandemic.

When the literature is examined, there are similar studies indicating that teachers think that school administrators perform technological leadership roles successfully (Anderson & Dexter, 2005; Bas, 2012;

Durnali & Akbasli, 2020; Olcek, 2014; Thannimalai & Raman, 2018; Ulgen, 2021; Irmak, 2015). Besides, studies examining the technology leadership competencies of school administrators during the Covid-19 pandemic, like this research, generally indicate positive results, too (Berkovich & Hassan, 2022; Hamzah, Nasir & Wahab, 2021; Karakose, Polat & Papadakis, 2021). Although these results do not demonstrate that school administrators fulfill their technology leadership roles perfectly, they are at a good place for the education system which is increasingly becoming technology-oriented, and specifically for the Covid-19 pandemic period during which almost all of the educational activities were carried out through technology.

The Covid-19 pandemic period has been a time when educational processes were largely carried out through distance learning, and dependence on technological tools and processes reached the highest level ever since. During this period, schools worldwide were partially or fully closed, and the connection between students and the educational processes could only be maintained through technological devices. Turkiye was one of the countries where schools remained closed for a long time during this period (OECD, 2022; UNESCO, 2021). Therefore, t school administrators' technology leadership roles have gained particular importance since the veriy beginning of this period. Indeed, many studies in the literature indicate that school administrators with high technological or digital competencies contribute to teachers' motivation (Lubis, 2019) as well as the overall success and effectiveness of the school (Flanagan & Jacobsen, 2003; Hamzah, Nasir & Wahab, 2021). From this perspective, it is important that school administrators effectively meet the requirements as adapting to the technological tools and processes which have been unexpectedly brought about by the Covid-19 pandemic to prevent potential learning losses that may affect students during and after such periods as Covid-19 pandemic.

According to the results obtained from the research, it is seen that the highest mean scores of both classroom teachers and branch teachers' opinions belong to human-centeredness dimension regarding the technological leadership roles of school administrators. This can be explained by the fact that technology is not tools and processes developed against human beings but it is tools and processes developed for the benefit of human beings. Particularly, understanding that human resources, with their affective and higher-order cognitive skills, are the main element that ensure the functionality of technology has contributed to the increasing significance of human-centeredness in effective technology leadership (Bhatt, 2001; Holford, 2019). This fact is particularly significant for schools since schools are the organizations where the human beings are the main actors in all processes and are at the first place among the organizations with the human-centric values. Therefore, it is critical such organizations as schools whose functions mostly depend on human beings to prioritize human-centeredness in processes which aim at increasing technology usage and effectiveness. In this sense, the results which indicate the positive opinions of teachers about human-centeredness as an important dimension of technology leadership of school administrators can be regarded as an opportunity for schools.

Another question that was explored within the scope of this research is whether teachers' opinions on school administrators' technology leadership roles during the Covid-19 pandemic differed based on their genders, branches, and seniorities. In this regard, firstly the gender variable was examined and it was found that being a female or a male teacher did not lead to any differentiation in their opinions on school administrators' technology leadership roles. This finding aligns with the findings of other studies conducted in the literature (Bas, 2012; Deniz & Teke, 2020; Engur, 2014; Hayytov, 2013; Olcek, 2014; Oztas, 2013; Sincar, 2009). However, when examining the mean scores of female and male teachers, it is observed that the mean scores of female teachers are higher than those of male teachers. A similar difference indicating higher mean scores for female teachers' opinions on technology leadership roles of school administrators was also found in a study conducted by Gercek (2016). This situation can be associated with the differentiation in knowledge and expectations of females and males regarding technology use. In fact, studies on technology acceptance (Akturk & Delen, 2020; Sirakaya, 2019) have found that male teachers have a higher level of technology acceptance compared to female teachers.

According to the results of this study regarding teachers' opinions of school administrators' technology leadership roles during the Covid-19 pandemic, no differentiation was observed for the total of technology leadership scale, including the human-centeredness dimension, communication and collaboration dimension, and support dimension, based on their branches. Similar studies in the literature also indicate that there is no differentiation in teachers' opinions based on the school level (Deniz & Teke, 2020; Sincar & Aslan, 2011; Ulgen, 2021). Comparisons conducted between primary school and secondary school teachers within the

context of school level give some clue about the comparisons of branch and classroom teachers since classroom teachers generally work at primary schools and branch teachers generally work at secondary or high schools. So, the studies examining the differences of teachers according to school level can be accepted as similar to this study. Although no difference was found in teachers' opinions for human-centeredness, communication and collaboration, and support dimensions, a statistically significant difference was found for vision dimension. Accordingly, classroom teachers hold more positive opinions regarding the vision dimension than branch teachers. Besides, it is seen that classroom teachers' mean score is higher than those of branch teachers for technology leadership roles of school principals in total even though this difference is not statistically significant. Similarly, Engur (2014) also found that the overall mean scores of primary school teachers regarding school administrators' technology leadership were higher than those of secondary school teachers. The researcher relates this finding to the increased level of technology usage among secondary school teachers since they deal with older students who are really good at technology and mostly dependent on technology during their daily lives. So, it is possible to infer that as student become older, their technology related expectations from teachers and schools get higher and as students' technology related expectations from teachers get higher, teachers' technology related expectations from school administrators get higher, too. As a supporting research finding for this inference, Sirakaya (2019) found in his study that the technology acceptance level of secondary school teachers was higher than that of primary school teachers. Such a research finding can also be accepted as a supporting evidence for the inference that classroom teachers may have lower expectations from school administrators in the context of technology leadership.

Finally, within the scope of the research, an investigation was conducted to determine whether there was differentiation in teachers' opinions on school administrators' technology leadership roles during the Covid-19 pandemic based on their seniority. According to the results, it was found that there was no differentiation. Similar studies in the literature also indicate that there is no differentiation in teachers' opinions based on their seniorities (Deniz & Teke, 2020; Durnali, 2019; Ulgen, 2021). In summary, these findings indicate that teachers, regardless of their demographic characteristics, find school administrators successful in performing technology leadership roles during the Covid-19 pandemic. When the results obtained from this study and findings of other researches which were conducted before 2020 (Anderson & Dexter, 2005; Bas, 2012; Durnali & Akbasli, 2020; Olcek, 2014; Thannimalai & Raman, 2018) and after 2020 (Berkovich & Hassan, 2022; Hamzah, Nasir & Wahab, 2021; Karakose, Polat & Papadakis, 2021) are evaluated together, it can be seen more clearly that school administrators have successfully fulfilled their technology leadership roles, which have gained critical importance especially during the Covid-19 period. Indeed, school administrators' technological leadership roles became more critical than ever during the Covid-19 period, and teachers had the opportunity to observe school administrators more closely in this context. So, teachers' positive opinions on school administrators' technology leadership roles in such a context has become more valuable because of the importance of providing support to school members for technology adaptation and usage for being an effective technology leader (Banoglu, 2011; ISTE-A, 2009; Sugar & Holloman, 2009). It should also be noted that Covid-19 period has been a time when teachers have needed more support than ever for technology usage in education processes and study findings indicate that school administrators mostly could have met this need.

Recommendations

Based on the results obtained from the research, several recommendations that are believed to contribute to both the implementation and the literature have been developed. In this regard, it is considered important to implement a selection process that takes the technological competencies of school administrators into account so that they perform technology leadership roles more effectively especially when needed. Similarly, prioritizing the development of technological competencies school administrators in professional development activities can be used as a tool that will enhance their technological leadership competencies. In addition to these recommendations for implementations, some recommendations that may contribute to the development of the literature have been formulated by considering the limitations of the study. The most significant limitation of this is the fact that data were obtained from a single source due to the cost-effectiveness principle. Therefore, it is deemed important in future studies on school administrators' technology leadership to work with sample groups representing different geographical regions or cities and to collect data from multiple sources using multiple data collection methods and instruments.

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THE EFFECT OF USING WHATSAPP BOT ON ENGLISH VOCABULARY LEARNING

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Received: 15/05/2023 **Accepted:** 21/09/2023

ABSTRACT

This study tried to design a WhatsApp bot to be implemented in English language vocabulary learning context in Oman. 150 Omani English as a Foreign Language (EFL) students from three different proficiency levels were selected based on random sampling. To measure the effectiveness of the treatment, pretests, posttests, and delayed posttests were conducted, respectively. The TAM 2 extended questionnaire was also used to understand learners' perceptions regarding the use of the WhatsApp bot in the learning process. The results of the study revealed that the WhatsApp bot, on all three levels, works nicely and practically. Although experimental groups, who used WhatsApp bot, at elementary and intermediate levels showed significant differences from the traditional face-to-face classes, pre-intermediate students showed no significant difference between the two mentioned terms. It was also understood that chatbots could be the best supplementary materials assisting teaching in delivering materials.

Keywords: WhatsApp bot, vocabulary, English language vocabulary, Oman.

INTRODUCTION

Artificial intelligence (AI) is among the recent technological advancements that are believed to be significant in solving problems (Schmidt & Strasser, 2022). AI is a technological invention designed to deal with the discipline that focuses on developing methodologies and techniques for high-level reasoning associated with low-level derived features devoid of explicit human control (Healey, 2020). Technology is well-received and increasingly utilized in education (Roos, 2018). Okonkwo and Ade-Ibijola (2021) put forward that the chatbot system is one of the most accepted AI technologies used in teaching and learning operations. This technological device is applied to conversational or interactive instructions to give immediate feedback to the user (Okonkwo & Ade-Ibijola, 2021; Smutny & Schreiberova, 2020).

Chatbot is defined as computer software that stimulates human-like conversations with human users either by way of talking (Brustenga et al., 2018; Pham et al., 2018), in the form of text messages (websites or mobile applications), voice-based (Alexa or Siri) or by intermingling these three techniques (Pereira et al., 2019; Sandoval, 2018). Various types of chatbot software are designed to imitate and perform the tasks that humans initially did. That is, they can be used not only for chatting with users but also to develop tools with a desired function depending on the designer's needs (Riel, 2020; Khan et al., 2019; Wang et al., 2021).

Chatbots have progressively been deployed in various fields, such as commerce, the service industries, and education. Moreover, some studies (Perez et al., 2020; Rapp et al., 2021; Smutny & Schreiberova, 2020; Chaiprasurt et al., 2022; Clarizia et al., 2018) show that chatbots are ideal for potentially changing the methods of students' learning and facilitating their access to relevant information according to the educational framework.

Chatbot systems assist students in the context, including providing mobile web applications to aid learning (Okonkwo & Ade-Ibijola, 2021). Others comprise giving such instant standardized information as course contents to students (Cunningham-Nelson et al., 2019), offering questions and answers for practice (Sinha et al., 2020), presenting evaluation criteria (Durall & Kapros, 2020), reminding students of the due dates for assignments, and giving instructions and recommendations (Ismail & Ade-Ibijola, 2019); guiding students to different locations on the campus (Mabunda & Ade-Ibijola, 2019), and issuing students with learning materials (Okonkwo & Ade-Ibijola, 2021) among others.

Okonkwo and Ade-Ibijola (2021) assert that the application of the software for facilitating individualized learning experiences, which is more convenient to students, is beyond compare with that of many other ways of interactions, including the use of email communication, student-to-student interaction, and student-to-lecturer interaction. This assertion is supported by Cunningham-Nelson's et al. (2019) findings that Chatbot equipment permits students to have a more personalized and engaging learning environment.

Several studies on Chatbot technology confirm that the system has more advantages over others in education. Clarizia et al. (2018) and Sinha et al. (2020) demonstrate that Chatbots are more appropriate for answering students' questions. Okonkwo and Ade-Ibijola (2021), Pham et al. (2018), and Zhao et al. (2020) affirm that applying chatbot is the best way to learn how to understand Computer Programming concepts. Durall and Kapros (2020), Rohrig and Heβ (2019) find that a chatbot is the most fitting gadget for assessing students' performance abilities and providing administrative services. This system is called a mobile-based chatbot (Kumar et al., 2021). Chatbots used in this area are favorable in facilitating collaborative learning (Schmulian & Coetzee, 2019), multimodal communication (Haristiani et al., 2019), scaffolding, real-time feedback (Gonda et al., 2018), personalized learning (Oke & Fernandes, 2020; Verleger & Pembridge, 2019), scalability, interactivity (Dekker et al., 2020) and fosters knowledge creation and dissipation effectively (Verleger & Pembridge, 2019).

The present study aims to explore the extent of the impact of chatbot-based learning systems on learning performance and their motivation within the framework of self-determination theory. Consistent with these objectives, Ryan and Deci (2000), Yin et al. (2021), Winkler and Soellner (2018), Liu et al. (2020), and Maroengsit et al. (2019) posit that to identify the prominence of chatbots, it is necessary to examine its significance in supporting learning theory according to other forms of learning settings. Therefore, the study will contribute to the knowledge of chatbot-based learning, functionality, usability, and user satisfaction. It will also update practitioners on the use of chatbots in education.

The following questions will be analyzed comprehensively to strengthen the existing literature on chatbots and to measure the implementation of WhatsApp bots in the English language learning contest.

1. Does the use of WhatsApp bot have a statistically significant effect on Omani elementary, pre-intermediate, and intermediate EFL learners' vocabulary learning?
2. Do Omani students learn the words better using WhatsApp or following the teacher`s instructions?
3. Does the use of WhatsApp bot have a statistically significant effect on Omani elementary, pre-intermediate, and intermediate EFL learners' vocabulary retention?
4. What are Omani EFL learners' perceptions of using WhatsApp bots in the EFL context?

LITERATURE REVIEW

Chatbots are agreed to be the most recent ingenious invention that provides valuable explanations for solving many of the problems of applying technology for supporting teaching and learning activities. This can be seen from how Chatbots create an interactive learning session, such as one-to-one interaction between the teacher and the students. The software is also a beneficial instrument for improving students' learning skills at an individual level (Colace et al., 2018).

Chatbot is perfect for allowing the students to comfortably participate in learning activities at their pace without feeling disturbed that they are being waited for by the instructor or their fellow students. Chatbots support students' educational engagements. The system also benefits teachers in the learning environment (Colace et al., 2018).

Chatbots are gaining popularity nowadays, fundamentally becoming unavoidable means of controlling how humans interact with the expanding digital world (Dale, 2016). This AI control will extend from reading and writing to listening and speaking. The availability of online chatbots within most messaging applications and many information-orientated websites such as universities, libraries, and museums all point to the fact that one of the many revolutions that chatbots will bring is the manner of learning a new language by human beings (Fryer et al., 2020). This can be proved by the fact that there has been an enormous increase in the manufacturing of gadgets related to language learning in the online software sector in the past five years (Zhou et al., 2018). However, despite witnessing the recurrent emergence of new gadgets that make even machine translation obsolete means of learning a new language, there is still a strong desire for other means of learning languages (Fryer et al., 2020).

Riel (2020) defines educational chatbots (ECs) as computer programs that aid in achieving educational goals within the parameters of traditional techniques. Many empirical studies have positioned chatbots as personalized teaching assistants or learning partners (Chen et al., 2020; Brustenga et al., 2018). The teaching assistant software provides scaffolding (Tutor Support) through practice activities (Brustenga et al., 2018). Support includes personalized learning, multimodal content (Schmulian & Coetzee, 2019), and instant interaction without time limits (Chocarro et al., 2021). Numerous other benefits have been identified concerning positive experiences (Ismail & Ade-Ibijola, 2019; Schmulian & Coetzee, 2019); such benefits include the ability to improve learning confidence (Chen et al., 2020) motivation, self-efficacy, learning control (Winkler & Soellner, 2018), engagement (Sreelakshmi et al., 2019), knowledge retention (Cunningham-Nelson et al., 2019) and access to information (Stathakarou et al., 2020). Furthermore, ECs were found to provide value and learning choices (Yin et al., 2021), which is beneficial in customizing learning preferences (Tamayo et al., 2020).

Some models of chatbots use MIM applications to turn into kinds of software that are popularly known as messenger bots (Schmulian & Coetzee, 2019). They predominantly work to facilitate twenty-four hours of unbroken interactions and communication automatically. Although MIM applications were not initially meant for pedagogical use, their straightforwardness made them a recognized environment for learning activities (Kumar et al., 2021; Pereira et al., 2019). The recognition of being effective and strategized communication media made chatbots gradually become a ubiquitous channel for imparting enhanced knowledge (Vazquez-Cano et al., 2021; Kumar et al., 2021). Other reasons for the dominance of ECs in learning situations are the facts that they are scalable individually (Chen et al., 2020; Ondas et al., 2019; Chocarro et al., 2021; Stathakarou et al., 2020); they support learning management (Colace et al., 2018); they are excellent in context-sensitive information delivery (Yin et al., 2021); they encourage participation, disclosure of personal aspects (Tamayo et al., 2020; Verleger & Pembridge, 2019; Brandtzaeg & Folstad, 2018; Ischen et al., 2019; Wang et al., 2021). These chatbot functions, which are impossible in face-to-face interaction, make the system more recognizable in the current teaching profession. Additionally, AI has the capacity to provide a chance to diagnose mental fitness (Dekker et al., 2020) based on the fact that it allows for a safe and confidential environment where even when a learner makes mistakes, they can personally learn how to correct them (Winkler & Soellner, 2018).

Cunningham-Nelson et al. (2019) point out that the ability of EC to deal with a large number of users' demands concurrently is one of the EC's primary advantages over the traditional teaching method. This is why Colace et al. (2018) view ECs as helpful in controlling a classroom situation involving multiple students,

perfect for augmenting autonomous learning skills (Kumar et al., 2021; Yin et al., 2021). Participating in revealing the benefits of using chatbots, Meyer von Wolff et al. (2020) claim that the systems are appropriate instructional devices to be utilized in higher education by both students and lecturers. They point out that, although the applications may be found to be challenging to operate by the instructors, especially when they do not master the code, the computerization of some of the lecturer/student interactions could provide the educators an opportunity to pay more attention to other pedagogical requirements (Schmulian & Coetzee, 2019; Gonda et al., 2018).

WhatsApp in Education

WhatsApp is a computer application for disseminating information among groups of users concerning their relationships. This feature makes the application ultimate for language teaching and learning (Ahmed, 2019; Mbukusa, 2018; Nuraeni & Nurmalia, 2020). For example, some studies (Dewi, 2019; Hamad, 2017; Kheryadi, 2018; Urien et al., 2019) establish that integrating WhatsApp into the teaching and learning process helps students to build confidence and interest. Such advantages manifest when students use WhatsApp to improve their vocabulary, verbal interaction outside the classroom, and writing skills (Ahmed, 2019).

Tamayo et al. (2020) use a brand of chatbot called EconBot in teaching and learning environments. They find that the students are interested in the learning process in which the EconBot is a supportive conversational tool that gives them independent learning modalities. Similarly, Cetinkaya (2017), Rosenberg and Asterhan (2018) stated that artificial intelligence is used to update WhatsApp so that it becomes an auto-responder. The auto-responder is used to privately access voiced messages using students' mobile devices rather than through the classroom WhatsApp group.

Smutny and Schreiberova (2020) and Fryer et al. (2020) add that chatbots are still not dominating or even meaningfully infiltrating the method of learning languages. Schmidt and Strasser (2022) also believe that AI-based foreign language learning is still in its infancy. According to them, this retardation results from the complexity of such systems, causing the development of AI-based high-level subject learning and practice that adapt to learner heterogeneity to be very slow.

Wang et al. (2021) argue that the applications of chatbots in education and being novel are also impacted by scarcity.

According to Smutny and Schreiberova (2020), Wang et al. (2021), and Winkler and Soellner (2018), language learning is the most trending area that received the most attention in educational chatbot (EC) research (Vazquez-Cano et al., 2021). Hence, it cannot be denied that EC plays a significant role despite its scanty literature outside of these contexts (Schmulian & Coetzee, 2019; Smutny & Schreiberova, 2020), and their presence in the introductory phases (Chen et al., 2020) which makes them limited by scanty examples within the domain of educational field (Stathakarou et al., 2020). However, because their absence in these fields is unavoidable, it is also an ideal potential to discover innovations in educational technologies within all disciplines (Wang et al., 2021). In addition, according to Tegos et al. (2019), research on the integration and use of chatbots in real educational contexts is still valid (Kumar et al., 2021).

METHODOLOGY

Participants

150 Omani EFL learners studying English General Skills were randomly selected based on three English proficiency levels: elementary, pre-intermediate, and intermediate. 50 participants were included in each level, including 25 students in the control group and 25 in the experimental group. The participants were Arabic native speakers passing the preparatory courses for higher education. Elementary students passed the college's placement test, while the other two groups were a combination of those who passed the previous semester or came directly through the placement test. Their age range was between 18 and 20, with both males and females in each class.

Instruments

Tests

To conduct the study, the researcher designed three sets of tests: pretests, posttests, and delayed posttests to monitor participants' knowledge, progress, and retention levels before and after implementing the treatment. A total of 9 tests were conducted in this study. All the tests had an equal number of questions 10 and a combination of fill-in-the-blank and multiple-choice formats. The results of the questionnaires were measured by SPSS software version 16.0.

Prior to the conduction of the tests, these sets were validated by two Ph.D. holders in Applied Linguistics and were additionally piloted by a group of 25 Omani EFL students at the same college. Table 1 shows the reliability of tests.

Table 1. The Reliability between the First and Second Administration of the Vocabulary Tests at Different Levels

	Cronbach's Alpha	N of Items
Test Elementary	.82	2
Test Pre-intermediate	.85	2
Test Intermediate	.89	2

The reliability of the tests was checked in a pilot study with 25 participants by the test-retest method. As can be seen, the test enjoyed a high reliability index for the elementary (R= .82), pre-intermediate (R= .85), and intermediate levels (R= .89).

Pathway Series Books

The participants of the study must be able to pass all the assessments related to the Pathway Series, developed by National Geographic Learning. There are two books at each level; one is designed for reading and writing skills, and the other for listening and speaking skills. Each book has different units, and each unit is divided into three lessons, including lessons A, B, and C. This study focused on Lessons A and B. Before the beginning of each lesson, 10 new vocabulary words are introduced to be covered weekly; therefore, this study covered 20 words from each level, with a total number of 60 for all levels.

Whatassbot

Using Python programming Language, a WhatsApp bot was designed for vocabulary learning. The program, then, was associated with a local phone number. The words were written in the bot database and were updated every three days to meet the course's delivery plan deadline by the college. The information students received included the word, a part of speech, a short definition, a synonym, an antonym, and a sentence example. (Appendix 1)

The Extended Technology Accepted Model Questionnaire (TAM2)

The last instrument used to determine the students' perceptions regarding WhatsApp bot implementation originated by Davis (1986) and was extended in 2000 (Venkatesh & Davis, 2000). The last one was used in this study. This questionnaire has seven aspects, organized through 25 items for the participants to select based on the Likert scale. Those seven aspects are perceived ease of use, usefulness, attitude, perceived behavior control, behavioral intention, self-efficacy, and personal innovativeness (Belda-Medina & Calvo Ferrer, 2022). The results of the questionnaires were measured by SPSS software version 16.0. (Appendix 2)

Table 2 shows that the Cronbach's Alpha reliability of the perception questionnaire with 25 items was found to be .89, which shows a rather high reliability index. There were 25 items in this questionnaire, so the range of scores could be from 25 to 125.

Table 2. Reliability Analysis for the Perception Questionnaire

Cronbach's Alpha	N of Items
.890	25

Procedures

The study was conducted in Fall Semester 2023, during the normal classes. The experimental groups received the new words and the related materials using a WhatsApp bot, while the control groups continued learning vocabulary according to their teachers` instructions.

Before the implementation of treatment, all the groups in 3 levels were given the pretest and told that they were participating in this study voluntarily. The treatment took two weeks, and the posttest was implemented. After another two weeks, the delayed posttests were conducted to measure vocabulary retention. All these tests were given 15 minutes to be completed.

Data Analysis

The following table shows the descriptive statistics for the pretest and posttest scores of elementary, pre-intermediate, and intermediate Omani EFL learners.

Table 3. Statistics for the Pretest/Posttest of the Three Levels

	N	Minimum	Maximum	Mean	Std. Deviation
Elm_Pre_Exp	25	.00	5.00	2.56	1.293
Elm_Post_Exp	25	5.00	9.00	6.80	1.118
Preint_Pre_Exp	25	1.00	6.00	2.92	1.351
Preint_Post_Exp	25	5.00	9.00	7.04	1.274
Int_Pre_Exp	25	1.00	8.00	4.00	1.707
Int_Post_Exp	25	6.00	10.00	8.24	.879
Valid N (listwise)	25				

Table 3 shows the pretest and posttest scores for the elementary, pre-intermediate, and intermediate groups are 2.56, 6.8, 2.92, 7.04, and 4, 8.24, respectively.

Table 4. Wilcoxon-Singed Rank Test for the Vocabulary Learning within Each Level

	Elementary	Pre-intermediate	Intermediate
Z	-4.396b	-4.391b	-4.421b
Asymp. Sig. (2-tailed)	.000	.000	.000

The Wilcoxon signed-rank test (Table 5) shows that there is a statistically meaningful difference between the pretest and posttest of the vocabulary scores at the (1) intermediate level (Z = -4.39, p < .05), (2) pre-intermediate level (Z = -4.39, p < .05), and (3) intermediate level (Z = -4.21, p < .05). Therefore, using WhatsApp bot had a statistically significant effect on Omani EFL learners' vocabulary learning in all three proficiency levels.

This study's second research question aimed to find any statistically significant difference between the time when the teacher teaches the words in the face-to-face classes with the use of WhatsApp bot on Omani elementary, pre-intermediate, and intermediate EFL learners' vocabulary learning. The following table shows the descriptive statistics of the pretests and posttests of the two groups.

Table 5. Statistics for the Pretest and Posttest Scores of the Elementary Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	.00	5.00	2.60	1.354
ContPost	25	2.00	6.00	4.92	.909
ExpPre	25	.00	5.00	2.56	1.293
ExpPost	25	5.00	9.00	6.80	1.118
Valid N (listwise)	25				

Based on Table 5, the mean scores for the pretest and posttest of the control group were 2.60 and 4.92, while the mean scores for the pretest and posttest of the experimental group were 2.56 and 6.80, respectively. Since the design of the study was quasi-experimental with a pretest and posttest, the pretest scores of the participants were taken as the covariate, so analysis of covariate (ANCOVA) was used for the group comparison. Table 6 below shows the result of the ANCOVA test.

Table 6. ANCOVA for the Comparison of the Elementary Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	49.420a	2	24.710	26.040	.000	.526
Intercept	274.583	1	274.583	289.359	.000	.860
pretest	5.240	1	5.240	5.522	.023	.105
groups	44.640	1	44.640	47.042	.000	.500
Error	44.600	47	.949			
Total	1811.000	50				
Corrected Total	94.020	49				

As Table 6 shows, there was a statistically significant difference between the control and the experimental groups regarding their vocabulary learning scores at the elementary level, $F(1,47) = 47.04$, $p < .05$, partial $\eta 2 = .50$. Therefore, using WhatsApp bot had a statistically significant effect on Omani elementary EFL learners' vocabulary learning in comparison to the teacher's instructions.

Table 7 shows the descriptive statistics of the pretests and posttests of the two groups for pre-intermediate learners.

Table 7. Statistics for the Pretest and Posttest Scores of the Pre-intermediate Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	.00	6.00	2.76	1.562
ContPost	25	2.00	7.00	5.16	1.143
ExpPre	25	1.00	6.00	2.92	1.351
ExpPost	25	5.00	9.00	7.04	1.274
Valid N (listwise)	25				

The mean scores for the pretest and posttest of the control group were 2.76 and 5.16, while the mean scores for the pretest and posttest of the experimental group were 2.92 and 7.04, respectively. To compare the scores between the groups, ANCOVA was used accordingly. Table 8 below shows the result of the ANCOVA test.

Table 8. ANCOVA for the Comparison of the Pre-intermediate Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	58.311a	2	29.156	24.388	.000	.509
Intercept	257.700	1	257.700	215.557	.000	.821
pretest	14.131	1	14.131	11.820	.001	.201
groups	41.302	1	41.302	34.547	.000	.424
Error	56.189	47	1.196			
Total	1975.000	50				
Corrected Total	114.500	49				

Based on Table 8, there was a statistically significant difference between the control and the experimental groups regarding their vocabulary learning scores at the pre-intermediate level $F(1,47) = 34.54$, $p < .05$, partial $\eta 2 = .42$. Therefore, using the WhatsApp bot had a statistically significant effect on Omani pre-intermediate EFL learners' vocabulary learning in comparison to teacher's instructions.

The following table shows the descriptive statistics of the pretests and posttests of the two groups for intermediate-level learners.

Table 9. Statistics for the Pretest and Posttest Scores of the Intermediate Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	1.00	6.00	3.40	1.258
ContPost	25	3.00	7.00	4.48	1.122
ExpPre	25	1.00	8.00	4.00	1.707
ExpPost	25	6.00	10.00	8.24	.879
Valid N (listwise)	25				

Based on Table 9, the mean scores for the pretest and posttest of the control group were 3.40 and 4.48, while the mean scores for the pretest and posttest of the experimental group were 4 and 8.24, respectively. The comparison of two groups at the intermediate level revealed the following data in Table 10 based on ANCOVA:

Table 10. ANCOVA for the Comparison of the Intermediate Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	190.948a	2	95.474	129.796	.000	.847
Intercept	171.510	1	171.510	233.166	.000	.832
pretest	14.228	1	14.228	19.343	.000	.292
groups	150.568	1	150.568	204.695	.000	.813
Error	34.572	47	.736			
Total	2248.000	50				
Corrected Total	225.520	49				

Table 10 revealed that there was a statistically significant difference between the control and the experimental groups regarding their vocabulary scores at the intermediate level, F (1, 47) = 204.69, p < .05, partial η2 = .81. Using WhatsApp bot had a statistically significant effect on EFL learners' vocabulary learning at the intermediate level in comparison to teacher's instructions.

The following table shows the descriptive statistics for the pretest and delayed posttest scores to measure the use of WhatsApp bot and vocabulary retention.

Table 11. Statistics for the Pretest/Posttest of the Three Levels

	N	Minimum	Maximum	Mean	Std. Deviation
ELM_ExpPre	25	.00	5.00	2.56	1.293
ELM_Exp_Delayed	25	2.00	5.00	3.64	.700
Prei_ExpPre	25	1.00	6.00	2.92	1.351
Prei_Exp_Delayed	25	2.00	5.00	3.84	.850
Int_ExpPre	25	1.00	8.00	4.00	1.707
Int_Exp_Delayed	25	3.00	8.00	5.96	1.457
Valid N (listwise)	25				

Based on Table 11, the pretest and delayed posttest scores for the elementary, pre-intermediate, and intermediate groups are 2.56, 3.64; 2.92, 3.84; and 4, 5.96, respectively.

Table 12. Wilcoxon-Singed Rank Test for the Vocabulary Retention within Each Level

	Elementary	Pre-intermediate	Intermediate
Z	-2.878b	-2.327b	-4.021b
Asymp. Sig. (2-tailed)	.004	.020	.000

The Wilcoxon signed-rank test (Table 12) shows that there was a statistically meaningful difference between the pretest and posttest of the vocabulary scores at the (1) elementary level (Z = -2.87, p < .05), (2) pre-intermediate level (Z = -2.32, p < .05), and (3) intermediate level (Z = -4.02, p < .05). Therefore, it can be concluded that WhatsApp bot had a statistically significant effect on Omani EFL learners' vocabulary retention.

The following table shows the descriptive statistics of the pretests and posttests of the two groups for the elementary level.

Table 13. Statistics for the Pretest and Posttest Scores of the Elementary Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	.00	5.00	2.60	1.354
ExpPre	25	.00	5.00	2.56	1.293
Cont_Delayed	25	2.00	4.00	3.44	.583
Exp_Delayed	25	2.00	5.00	3.64	.700
Valid N (listwise)	25				

Based on Table 13, the mean scores for the pretest of the control and experimental groups were 2.60 and 2.56, while the mean scores for the delayed test of the control and experimental groups were 3.44 and 3.64, respectively. Table 14 below shows the result of the ANCOVA test.

Table 14. ANCOVA for the Comparison of the Elementary Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.651a	2	.325	.773	.467	.032
Intercept	134.382	1	134.382	319.481	.000	.872
pretest	.151	1	.151	.358	.552	.008
groups	.491	1	.491	1.168	.285	.024
Error	19.769	47	.421			
Total	647.000	50				
Corrected Total	20.420	49				

As Table 14 shows, there was not any statistically significant difference between the control and the experimental groups regarding their vocabulary scores at the elementary level, F (1,47) = 1.16, p > .05, partial η2 = .02. Therefore, the use of WhatsApp bot did not have a statistically significant effect on EFL learners' vocabulary retention of elementary students.

The following table shows the descriptive statistics of the pretests and posttests of the two groups of pre-intermediate level.

Table 15. The Descriptive Statistics for the Pretest and Posttest Scores of the Pre-intermediate Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	.00	6.00	2.76	1.562
ExpPre	25	1.00	6.00	2.92	1.351
Cont_Delayed	25	2.00	4.00	3.36	.568
Exp_Delayed	25	2.00	5.00	3.84	.850
Valid N (listwise)	25				

In Table 15, the mean scores for the pretest of the control and experimental groups were 2.76 and 2.92, while the mean scores for the delayed test of the control and experimental groups were 3.36 and 3.84, respectively. Table 16 below shows the result of the ANCOVA test.

Table 16. ANCOVA for the Comparison of the Pre-intermediate Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3.049a	2	1.524	2.872	.067	.109
Intercept	139.765	1	139.765	263.275	.000	.849
pretest	.169	1	.169	.318	.575	.007
groups	2.949	1	2.949	5.556	.023	.106
Error	24.951	47	.531			
Total	676.000	50				
Corrected Total	28.000	49				

As Table 16 shows, there was a statistically significant difference between the control and the experimental groups regarding their vocabulary scores at the pre-intermediate level, F (1, 47) = 5.56, p < .05, partial

η2 = .10. Therefore, the use of WhatsApp bot had a statistically significant effect on EFL learners' vocabulary retention of pre-intermediate students.

The following table shows the descriptive statistics of the pretests and posttests of the two groups for intermediate learners.

Table 17. Statistics for the Pretest and Posttest Scores of the Intermediate Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	1.00	6.00	3.4000	1.25831
ExpPre	25	1.00	8.00	4.0000	1.70783
Cont_Delayed	25	2.00	7.00	4.6800	1.14455
Exp_Delayed	25	3.00	8.00	5.9600	1.45717
Valid N (listwise)	25				

In Table 17, the mean scores for the pretest of the control and experimental groups were 3.40 and 4, while the mean scores for the delayed test of the control and experimental groups were 4.68 and 5.96, respectively. Table 18 below shows the result of the ANCOVA test.

Table 18. ANCOVA for the Comparison of the Intermediate Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	37.760a	2	18.880	13.627	.000	.367
Intercept	100.475	1	100.475	72.517	.000	.607
pretest	17.280	1	17.280	12.472	.001	.210
groups	12.979	1	12.979	9.368	.004	.166
Error	65.120	47	1.386			
Total	1518.000	50				
Corrected Total	102.880	49				

As Table 18 shows, there was a statistically significant difference between the control and the experimental groups regarding their vocabulary scores at the intermediate level, $F(1, 47) = 9.36$, $p < .05$, partial η2 = .16. Therefore, the use of WhatsApp bot had a statistically significant effect on EFL learners' vocabulary retention of intermediate students.

Question 4 was raised to find the EFL learners' perceptions concerning using chatbots in language learning.

The following table shows the descriptive statistics of the test perception questionnaire.

Table 19. Statistics Analysis for the Perception Questionnaire

	N	Minimum	Maximum	Mean	Std. Deviation
Sum	75	50.00	83.00	72.84	9.98
Valid N (listwise)	75				

Based on Table 19, the minimum and maximum scores are 50 and 83, and the mean and standard deviation scores are 72.84 and 9.98, respectively.

Table 20. Item Analysis for the Perception Questionnaire

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Status
item1	75	1	4	3.09	Average
item2	75	1	4	3.15	Average
item3	75	2	3	2.73	Average
item4	75	1	4	3.33	Average
item5	75	1	4	3.11	Average
item6	75	2	3	2.93	Average
item7	75	1	5	2.88	Average
item8	75	2	4	3.13	Average
item9	75	1	4	3.49	High
item10	75	1	3	2.71	Average
item11	75	1	3	2.83	Average
item12	75	2	4	3.07	Average
item13	75	1	4	3.24	Average
item14	75	2	3	2.73	Average
item15	75	1	3	1.84	Average
item16	75	1	3	2.01	Average
item17	75	1	4	3.31	Average
item18	75	1	4	3.19	Average
item19	75	1	3	2.95	Average
item20	75	1	3	2.71	Average
item21	75	1	4	3.20	Average
item22	75	1	4	2.96	Average
item23	75	1	4	3.04	Average
item24	75	1	4	3.31	Average
item25	75	1	4	1.91	Average
Valid N (listwise)	75				

The items were in a Likert-scale format, from strongly disagree (1) to strongly agree (5). The researchers divided the scores (1 to 5) by three: Up to 1.66 shows low, from 1.67 to 3.33 shows average, and from 3.34 to 5 shows high motivation strategy scores. As Table 20 indicates, only item 9 (using chatbots in language learning allows the learners to study outside of the classroom) showed high perception, and the rest showed average perception. Among the average perceived ones, item 4 (I find chatbots in language learning to be flexible to interact with) was the highest, and item 15 (I am completely satisfied in using chatbots for language learning.) was the lowest.

DISCUSSION

The current study focused on designing a WhatsApp bot to measure its effects on vocabulary learning among Omani EFL students. In addition, the paper tried to compare the vocabulary tests among the students who received the words through WhatsApp bot or the teacher to measure the effective way to assist the language learners further.

After conducting 9 pretests, posttests, delayed posttests, and some statistical analysis, it was revealed that using the WhatsApp bot helped students of elementary, pre-intermediate, and intermediate to learn the words better in experimental groups in comparison to the control group. In addition, the study found that the experimental groups in preintermediate and intermediate levels outperformed their counterparts in vocabulary retention

tests, while in the pre-intermediate level, no significant differences were found between experimental or control groups. the following comparison of results between this study and others was elicited.

The results of this paper align with the findings of Yin et al. (2021), who developed a study based on chatbot learning to measure students` performance and motivation. Although the study showed students' improvements in the learning context, the results were not considered significant. Other studies by some chatbot specialists (Cheng et al., 2022; Chen et al., 2020) found that chatbot-based learning significantly affected the participants' achievements.

Abbasi and Kazi (2014) found that the students` memory retention and learning results of those who used chatbots during the learning process were remarkable, aligning with the current study's findings.

The findings of this study are for and against the results of As Sabiq and Fami (2020). They found that the chatbot was successful in the academic environment as supplementary teacher assistance. They helped the teachers to facilitate the delivery of materials and assessments. Based on their findings, using chatbots beside teacher-based instructions could improve the students` engagement and enthusiasm in the learning process.

The findings of the current study are against the findings of Chaiprasurt et al. (2022), who focused on using chatbots in learning to measure the motivation of the participants and stated that there was a huge gap between normal classes and chatbot usage. Their results revealed that the level of engagement among the participants increased dramatically. Tangkittipon et al. (2020) also showed a higher level of engagement after implementing chatbots, while participants of this study did not show such a type of excitement. The results are against the study by Folstad et al. (2014), whose findings revealed that the participants showed a positive attitude toward implementing new technology in learning environments.

CONCLUSION

The results of this comprehensive study on using WhatsApp bots determined that using such types of bots will facilitate the language learning process. Statistics revealed that the results of students in experimental groups of two levels show a significant effect of receiving instructions by Whatassbot. However, it was not approved in one of the levels. The logical explanation to justify the positive impact of WhatsApp bot is that, in the face-to-face instructions by the teacher, students are listeners, and they do not write materials taught by the teacher; however, since the new generation is interested in using mobile phones, most of the time, then sending the instructions for them through phone is helpful, accessible, and in case they are more of visual learners, then beneficial too.

The study has some implications for the teachers and learners concurrently. Based on the results of this study, it was approved that using bots in language learning can help the students improve their vocabulary level, so these bots will give them permanent access to the materials that assist them in progressing faster. In addition, teachers can use these bots to provide extra training, assessment, or materials to their students as supplementary tools, as the role of technology and artificial intelligence cannot be neglected in people's daily routines and academic lives.

This study has some limitations, concerns, and suggestions for further research.

- The population of this study was selected among Omani EFL candidates in one of the institutions in Oman, which makes the generalizability of the study difficult. Considering other proficiency levels of students, such as upper intermediate, advanced students, and higher education students, will reveal comprehensive results in designing and developing suitable educational technological tools.
- Since each institution has technological support and devices, further research in other locations in Oman or other countries may design a better map of technological effects on education.
- The application used in this study was a WhatsApp bot to learn vocabulary. Further research can be done to measure the effect of bots in other applications such as Messenger, and other skills, such as grammar, punctuation, and writing, to exemplify a few of them, can be beneficial.
- And finally, this bot was a one-way instruction from the host to the students. It would be fantastic if further interactive bots were designed so the learners could communicate and further analyze their language productions and mistakes.

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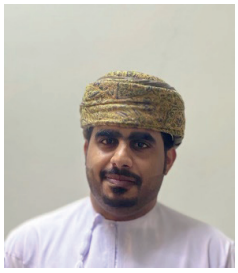

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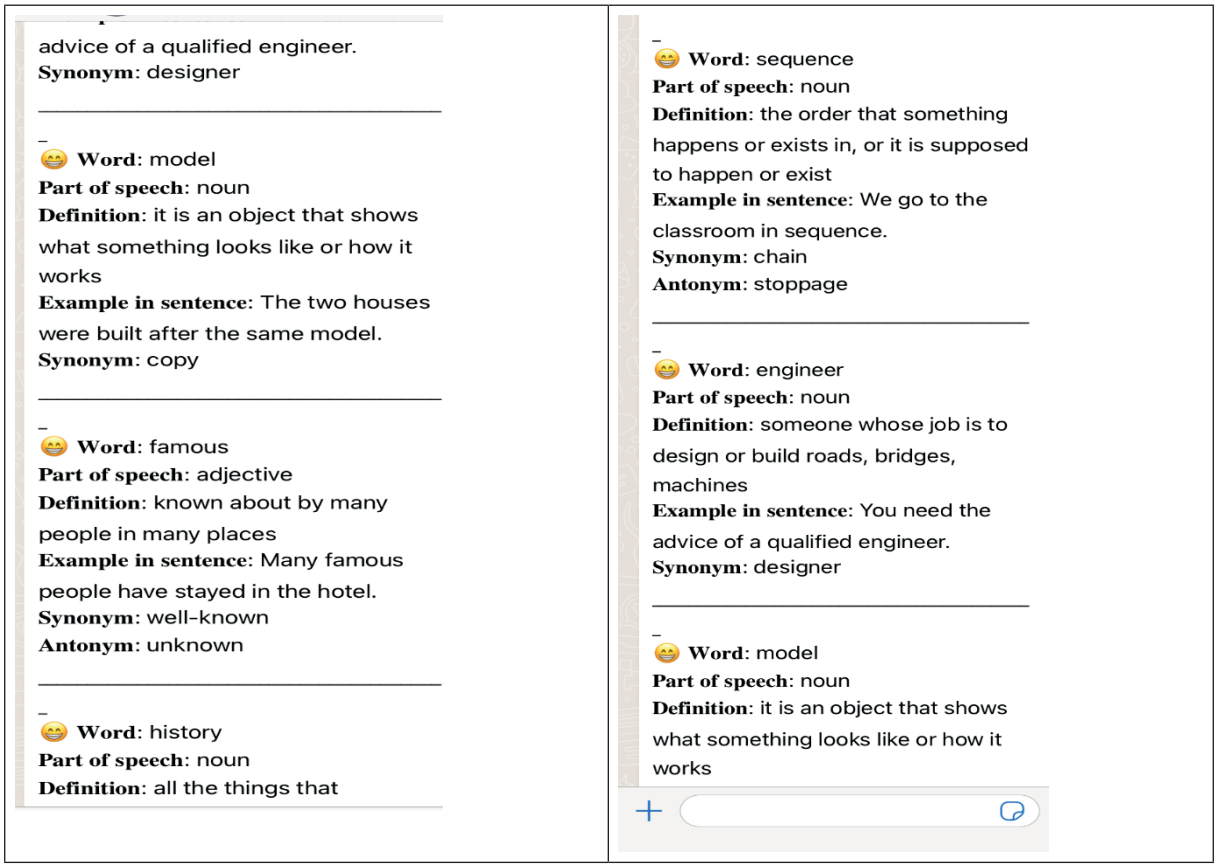
APPENDIX 1

Samples Screenshot of the WhatsApp Bot



advice of a qualified engineer.
Synonym: designer

Word: model
Part of speech: noun
Definition: it is an object that shows what something looks like or how it works
Example in sentence: The two houses were built after the same model.
Synonym: copy

Word: famous
Part of speech: adjective
Definition: known about by many people in many places
Example in sentence: Many famous people have stayed in the hotel.
Synonym: well-known
Antonym: unknown

Word: history
Part of speech: noun
Definition: all the things that

Word: sequence
Part of speech: noun
Definition: the order that something happens or exists in, or it is supposed to happen or exist
Example in sentence: We go to the classroom in sequence.
Synonym: chain
Antonym: stoppage

Word: engineer
Part of speech: noun
Definition: someone whose job is to design or build roads, bridges, machines
Example in sentence: You need the advice of a qualified engineer.
Synonym: designer

Word: model
Part of speech: noun
Definition: it is an object that shows what something looks like or how it works

APPENDIX 2

The Perception Questions

1. I find chatbots easy to use
2. Learning how to use chatbots is easy for me
3. It is easy to become skillful at using chatbots in language learning
4. I find chatbots in language learning to be flexible to interact with
5. The interaction with chatbots in language learning is clear and understandable
6. Using chatbots in language learning would increase the students' learning performance
7. Using chatbots in language learning would increase academic productivity
8. Using chatbots would make language learning easier
9. Using chatbots in language learning allows the learners to study outside of the classroom
10. Using chatbots in language learning is useful for context-based interactions as in real life
11. Chatbots enable students to learn more quickly in language learning
12. Chatbots make it easier to innovate in language learning
13. The advantages of chatbots in language learning outweigh the disadvantages
14. I believe that using chatbots will increase the quality of language learning
15. I am completely satisfied in using chatbots for language learning
16. I am very confident in using chatbots in language learning
17. Using chatbots in language learning is a good idea
18. I am positive towards using chatbots in language learning
19. Using chatbots in language learning is fun
20. I intend to use chatbots in language learning frequently
21. I intend to learn more about using chatbots in language learning
22. I feel confident in using chatbots in language learning
23. I have the necessary skills for using chatbots in language learning
24. I like to experiment with new technologies in language learning
25. Among my peers, I am usually the first to explore new technologies

DEVELOPMENT OF INSTAGRAM-BASED LEARNING MEDIA TO INCREASE STUDENTS LEARNING INTEREST IN ACID-BASE MATERIALS

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Received: 11/06/2023 **Accepted**: 22/09/2023

ABSTRACT

This study aims to determine the feasibility of Instagram-based chemistry learning media and the results of increasing student interest in learning acid-base material in everyday life with a multi-representation approach. The method used in this study is the ADDIE research and development model (Analysis, Design, Development, Implementation, and Evaluation). The research population is SMAN 3 Sidoarjo students, with the sample used being 89 students who carry out learning using Instagram in acid-base material in everyday life. Quantitative data was obtained from material and media validation results, as well as an analysis of student interest in learning before and after using the media. Qualitative data were obtained by analyzing descriptive questions of student learning interest in chemistry questionnaires. The results of the research on developing Instagram-based chemistry learning media on acid-base materials in everyday life with a multi-representation approach were obtained: 1) the feasibility of learning media developed based on the results of the assessment of materials and media by expert validators was included in the very feasible category; 2) the increase in students' learning motivation is in the medium category with a standard gain value of 0.40.

Keywords: Instagram, learning media, learning interest, acid-base, chemistry.

INTRODUCTION

Problems in education from this modern era must be resolved immediately. This problem includes aspects of the quality of education and supporting components for achieving learning objectives (do Amaral & Fregni, 2021). The quality of learning can be improved by innovating learning media that are adaptive to the current situation and integrated with technology (Yunus & Fransisca, 2020). This learning media facilitates student needs, including challenging facilities and infrastructure, liveliness, creativity, and the ability to innovate, be fun, and develop learning based on information and communication technology (Setiawan et al., 2021). Technology can provide more diverse learning facilities, including online learning (Bramastia & Purnama, 2021). Therefore, there is a need for adaptation for students in carrying out online learning.

Online learning also increases the intensity of students' use of gadgets. This gadget's use also impacts increasing the intensity of using social media (Gil-Fernandez & Calderon-Garrido, 2022). Students will open social media to spend their free time during the online learning process. 80% of people feel that social media can be used as entertainment and a distraction when dealing with daily routines during a pandemic (Rohmah, 2020). Instagram is one of the many social media that teenagers love. Instagram, as of July 2021, is known to have a total of 91.77 million users. The most dominant users are in the age segment 18-24 years, namely 36.4% (Annur, 2021). However, so far, Instagram has only been used as a medium of entertainment for its users because it has various features and meets the need to access photos, videos, and text. However, the use of Instagram certainly has a positive impact on students.

The use of Instagram brings many positive benefits that students can obtain. Students can find information easily, contact, and maintain kinship with family and friends. Instagram can be a means of increasing creativity, an entrepreneurial means of selling trending products, and a fun entertainment medium (Acun, 2020). Instagram has become essential to student interaction and lifestyle (Argyris et al., 2020). In addition, many smartphones provide free social media services for their users. The usefulness of Instagram is supported by features that are useful for students.

Instagram has several features that can support the online learning process, namely live streaming, which can be used as a teleconference for teachers to explain learning material to their students (Nawi et al., 2023). The post-feed feature can allow students to show their work results and work exhibitions online (Hussain et al., 2018). Instagram can present works and learning materials in videos or animations with a maximum duration of 30 minutes and a minimum of 1 minute (Ye et al., 2020). Instagram learning media can support the learning process but has not been used optimally.

The learning media used so far could have been more interactive and exciting (Khairunnisa, 2020). The use of learning media that is monotonous and unpleasant makes students bored in the online learning process. Passive learning makes students bored quickly, making it less effective (Pratiwi et al., 2020). Chemistry subjects that are abstract and conceptual experience problems in the implementation process. If it is not immediately addressed, there will be a decrease in learning outcomes.

Based on Bramastia's research, it can be seen that the weakness of the online learning process in chemistry at SMAN 6 Serang City is that 67.7% of students find it challenging to understand the material, 61.5% of students experience network or signal problems, 46.9% of students find it very dull, and 26.2% of students feel stuttered in the process of using media or technology. Therefore, online learning in chemistry is less effective (Bramastia & Purnama, 2021).

One of the chemistry materials that students need help understanding is acid and base materials. This acid-base material has basic competency knowledge about determining acid-base substances, differentiating the concept of acids according to Arrhenius, Brønsted-Lowry, and Lewis, determining natural materials that can be used as indicators, and identifying color changes of indicators in various solutions. Based on previous research data, the obstacles faced by students included 57.6% of students having difficulties using terms in acid-base material and 59.5% of students experiencing problems related to understanding the concept intact. The division of sub-materials that were considered problematic by students included the concept of acid theory, the concept of acid-base indicators, the concept of pH, the concept of ionization constants, and the concept of pH in life (Sanjiwani et al., 2018). These students struggle with learning because acids and bases are conceptual, abstract, representative, and very close to everyday life. The concept of acid-base matter requires understanding macroscopic, submicroscopic, and symbolic multi-representation. If students have problems understanding one of the representations, fully understanding the concept of acid-base material will not be easy (Widarti et al., 2020). Making it easier for students to understand the material requires a high interest in learning.

Interests are feelings of liking, interest, focus, persistence, effort, knowledge, and skills. Interest in learning is known through 3 indicators: interest, attention, and student learning motivation (Winoto & Prasetyo, 2020). Interest in learning supports students to be more active and continue to understand knowledge related to that field. Students will have high enthusiasm for learning material because of the feelings of pleasure it generates. Student attention will increase concentration, making it easy to grasp the learning

material (Ariyanto et al., 2020). Therefore, interest in learning must continually be improved. Based on this description, it is necessary to implement research titled "Development Of Instagram-Based Learning Media To Increase Students Learning Interest In Acid-Base Materials." This research is expected to increase students' interest in learning chemistry.

METHOD

Research Design

In learning media development, adopt the method developed by Robert Maribe Branch. This method has five steps: analysis, design, development, implementation, and evaluation (Soesilo & Munthe, 2020). The five steps will be described in depth and discussed as follows:

The first step, namely the analysis stage, consists of two stages: analysis of the needs of learning media used by students and teachers and analysis of acid-base material. The first stage is an analysis of the learning media needs used so far and what kind of media students and teachers want. Concept analysis is needed to identify acid-base material that will be included in learning media. Researchers mapped acid-base materials in everyday life based on the benchmarks of core competency and essential competency learning that have existed so far.

The second step is the design stage designing and presenting material excitingly and enjoyably to read. Design templates are made in advance so that the overall design of learning media can be uniform and neater. The Instagram feed design contains images that match the topic of the material and choose exciting typography. The video reel that is made must look for clips that are per the learning material. This design pays attention to the aspects of the material's beauty, readability, and coherence so that readers are clear when viewing the feed or reel on the Instagram homepage. Then it will create an Instagram account for researchers to post material regularly, and students can access it easily.

This third step is developing Instagram-based learning media, referring to the initial media planning. Several stages were passed by researchers in developing learning media in the form of Instagram, namely making feeds, stories, and learning videos, which would later be uploaded periodically according to the order of acid-base topics. The learning media was validated by a team of media experts and material experts to determine the feasibility level of using the media. After that, the researcher will make improvements to both the media and materials to the validator team's directions and suggestions so that they are expected to obtain quality content and learning media.

The fourth step is the implementation stage of Instagram-based learning media by conducting trials on students. Students can access accounts @chemsquad.kimia to obtain the latest material updates so that learning media's response and level of attractiveness are known.

The last step is the evaluation stage of the implementation results that have been carried out on the products made. This stage is a reflection and suggestion for implementing similar research in the future so that it is expected to obtain maximum results.

Time and Place of Research

This research was conducted at SMAN 3 Sidoarjo, located at Jl. Dr. Wahidin No.130, Sekardangan, Kec. Sidoarjo, Kabupaten Sidoarjo, Jawa Timur. The research was carried out in the odd semester of the 2021/2022 school year. This research starts from December 2021 to February 2022, from preparation to implementation or media trials.

Research Subject

The target students of the learning media developed are SMAN 3 Sidoarjo Class XI IPA 1, 3, and 4 students.

Data Collection Instruments

This study uses instruments that assist in retrieving the necessary research data. The instruments used were needs analysis questionnaires, validation sheets, Instagram feeds, videos, and learning interest questionnaires.

Data Analysis Technique

Data analysis in this study used qualitative and quantitative analysis techniques. Qualitative data in this study are in the form of input and suggestions from expert validators. Meanwhile, quantitative data was obtained by distributing questionnaires analyzing learning media needs and questionnaires responding to students' learning interests. The data will then be processed to obtain an overview of the results. These results will be a benchmark for the extent of success and achievements in a study. The results of data analysis are used as a guideline for improving Instagram-based learning media.

Analysis of learning media needs related to the use of Instagram social media by students is analyzed using the percentage formula as can be seen in Formula 1 (Sugiyono, 2018):

$$P = \frac{F}{N}$$

Information:

P: Percentage of student scores

F: Frequency of student scores

N: The number of students

The feasibility analysis of Instagram learning media is intended for teachers and students. This learning media feasibility questionnaire contains questions with semi-open answers. The writing order is the title, statement from the researcher, respondent identity, instructions for filling in, and question items. Quantitative questionnaire data can use a Likert scale as a measurement scale to be converted into a percentage value. This scale is arranged with five responses in the form of granules. This measurement scale was developed and modified by Riduwan's previous research. Quantitative analysis can be obtained from each answer in the form of a score, as shown in Table 1.

Table 1. Assessment Scores for The Questionnaire Answer Choices

Number	Quantitative Analysis	Those enrolled
1	Very Good	5
2	Good	4
3	Enough	3
4	Not Enough	2
5	Very Less	1

The assessment is given using a scale of one to five, describing very good, good, enough, less, and strongly disagree. The level of scale measurement in this study uses intervals. Interval data can be analyzed by calculating the average answer based on the score of each answer from the respondent.

$$\text{Percentage of Respondents' Answers} = \frac{\text{Number of Scores Obtained}}{\text{Total Highest or Ideal Score}} \times 100\ \%$$

The results of the assessment scores are then averaged from some trial sample subjects and converted into assessment statements to determine the quality and usefulness of the resulting product based on user opinion. Converting scores into these assessment requirements can be seen in Table 2.

Table 2. Learning Media Feasibility Scale

Percentage Score (%)	Interpretation
81% - 100%	Very Worth it
61% - 80%	Worthy
41% - 60%	Decent Enough
21% - 40 %	Less Eligible
0 % - 20 %	Very Less Worth It

Based on the table data above, the resulting score assessment results become a reference for the feasibility of the media and materials that have been developed. Learning media using Instagram for students' learning interest in acid-base solution material in everyday life with a multi-representational approach is categorized as very worth it or worthy.

The questionnaire results can be processed into percentages with the help of the Linkert scale as the measurement scale. This scale is prepared with five responses in the form of grains. This measurement scale was developed and modified by Riduwan's previous research. Quantitative analysis can be obtained from each answer as a score in Table 3.

Table 3. Assessment Scores for The Answer Choices for the Student Learning Interest Questionnaire

Number	Quantitative Analysis	Those enrolled
1	Very Good	5
2	Good	4
3	Enough	3
4	Not Enough	2
5	Very Less	1

After the average value is obtained, the next step is calculating the increase in student learning interest. Increased student interest in learning can be seen through the normalized Standard Gain value with the following equation (Sundayana, 2015).

$$\text{normalized gains } (g) = \frac{final\ motivation\ score - initial\ motivation\ score}{maximum\ score - initial\ motivation\ score}$$

The resulting Standard Gain value is then interpreted according to Table 4, which is as follows:

Table 4. Interpretation of Modified Normalized Gain

Normalized Gain Value	Interpretation
$-1.00 \leq g < 0.00$	There was a decline
$g = 0{,}00$	Still
$0.00 < g < 0.30$	Low
$0.30 \leq g < 0.70$	Medium
$0.70 \leq g < 1.00$	High

RESULTS AND DISCUSSION

Analysis Results

In this analysis stage, the researcher analyzed the learning media needs of students and teachers. This questionnaire contains essential indicators of students' needs for Instagram-based learning media. In addition, regarding support from schools in terms of means, it intends to find out how necessary Instagram media can be used in the teaching and learning process and the development of Instagram-based learning media by teachers. Eighteen statement points describe essential indicators related to the development of learning

media that have been carried out by teachers and used by students so far. Then, there are 12 indicators of questions asked to the teacher so that the development of Instagram-based learning media can be known so far. The questionnaire respondents consisted of 89 students from SMAN 3 Sidoarjo who came from 3 classes, namely XI MIPA 1, 3, and 4, who took acid-base chemistry subjects. Other respondents consisted of 2 chemistry teachers from SMAN 3 Sidoarjo. Filling out a questionnaire for analyzing the needs of learning media by students can be shown in Table 5 below:

Table 5. Results of Analysis of the Needs of Facilities for Instagram-Based Learning Media by Students

Number	Questions	Answer Options	Percentage
1	You have Instagram.	Yes	98.1
		No	1.9
2	Use Instagram regularly.	Yes	65.4
		No	34.6
3	Period of use of Instagram.	2-3 years	25
		> 3 years	75
4	Number of hours used Instagram per day.	3-4 hours/day	84.6
		> 4 hours/day	16.4
5	What are you using Instagram for?	Study	3.8
		Social/Play/ Entertainment	96.2
6	The school has internet/wifi	Yes	96.2
		No	3.8
7	The learning media used by the teacher has been integrated with Instagram in learning activities.	Yes	75
		No	25
8	If the answer is YES, how often do you use the media?	Every Meeting	2.3
		Several Meetings	97.7
9	The teacher introduces Instagram Feeds and Video Reels for learning activities.	Yes	67.7
		No	42.3
10	Using Instagram Feeds and Video Reels is a necessity for you?	Yes	53.2
		No	46.8
11	Using Instagram Feeds and Video Reels can make learning activities more fun.	Yes	63.5
		No	36.5
12	You have difficulty learning chemistry in acid-base material in everyday life.	Yes	55.8
		No	44.2
13	You already know about the multirepresentational approach in the chemistry learning process.	Yes	55.8
		No	44.2
14	Teachers have used a multirepresentational approach to acid-base material in everyday life.	Yes	69.2
		No	30.8
15	The teacher has provided sufficient and understandable explanations in learning acid-base chemistry material in everyday life with a multirepresentational approach.	Yes	25
		No	75
16	Teachers have used Instagram in chemistry learning media in acid-base material in everyday life with a multirepresentational approach.	Yes	26.9
		No	73.1
17	If the answer is NO, is it necessary to use Instagram media in the form of Instagram feeds and video reels in learning chemistry in acid-base materials in everyday life with a multirepresentational approach?	Yes	45.8
		No	54.2
18	Do you agree if the development of Instagram-based learning media is designed to increase students' interest in learning acid-base material in everyday life with a multirepresentational approach?	Yes	73.1
		No	26.9

This study develops several questions about students' needs for Instagram-based learning media. Based on the results of completing the questionnaire, the needs students need for Instagram-based learning media, especially in acid-base chemistry subjects in everyday life, will be known. The results of questionnaires and data processing in research can refer to Table 5. Based on Table 5 shows that 98.1% of students in grade 11 MIPA 1, 2, 3, and 4, as many as 53 students, have utilized and used Instagram in their daily lives. The students routinely use Instagram to complete their daily activities, as shown by the data of 65.4%. The use of these devices was 94.1% used by students 2-3 years ago with a percentage of 25%, and the majority were used more than three years ago with a percentage of 75%. The duration of using Instagram for students is 3-4 hours per day percentage of 84.6%, and it is used for learning with a small percentage of 3.8%. This finding is supported by previous research that adolescents have supporting facilities in accessing social media through more equitable and stable internet services (Rizky et al., 2018). Therefore, it is easier for 91% of youth aged 16-24 to access massive social media services (Febrianthi & Supriyadi, 2020). Social media, especially Instagram, can be used as an interactive learning media popular with students because it has become part of their daily life.

Schools support WIFI facilities to support online or offline learning and achieve maximum learning outcomes. Students stated that 67.7% of teachers had used Instagram-based learning media in the learning process, but as many as 97.7% only used it in a few meetings. In line with this, ruru introduced Instagram feeds and video reels for learning activities. Only 67.7%, so others needed to be literate in using Instagram to support existing learning. Students are highly interested in Instagram feeds and video reels, so they have become necessary to complement their lives, as evidenced by 53.2%. 63.5% of students agree that using Instagram feeds and video reels can make learning activities fun. Media in images will accelerate students' interpretation of a still abstract lesson and increase interest in learning (Safitri & Kabiba, 2020). In addition, the video becomes interactive multimedia with audio-visual elements to actively involve user responses (Hasibuan & Napitupulu, 2021). Instagram feeds and video reels are the right choices for finding information and fun entertainment for students.

Students experiencing difficulties in chemistry learning activities in acid-base material in everyday life can be seen from the data of 55.8% feeling that they have problems with the material. Even though as many as 55.8% of students are familiar with the multi-representational approach in acid-base material, which can help understand abstract chemical material. As much as 69% of teachers have implemented a multi-representational approach to acid-base material in everyday life when learning in class. As many as 75% of students feel they need to understand more about acid-base material in everyday life and feel bored during learning. Multirepresentational learning combines text, realistic images, or graphics, so students will find it easier to understand acid-base learning topics (Yuniarti et al., 2019). The multi-representational learning taught by the teacher can be actualized in the form of Instagram feeds and video reels, which can reduce the boredom experienced by students during the learning process (Ye et al., 2020).

Teachers have never used Instagram in chemistry learning media in acid-base material in everyday life with a multi-representational approach based on data of 73.3%. Instagram-based learning media interests students, especially at SMAN 3 Sidoarjo. This finding is also supported by data that most students at SMAN 3 Sidorajo have massively used and utilized Instagram in their daily lives, both at school and home. The use of Instagram in the learning process can also motivate students to actively participate in learning activities because of the ease of access anywhere and anytime. Therefore, 73% of students agreed to use Instagram to increase students interest in learning about acids and bases in everyday life with a multi-representational approach.

This questionnaire regarding the analysis of teacher needs for Instargam-based learning media has 12 question item indicators used to identify general needs. Questionnaire indicators can be seen in Table 6.

Table 6. Results of Analysis of Needs for Facilities for Instagram-Based Learning Media by Teachers

Number	Questions	Answer Options	Percentage
1	Teachers experience problems in determining learning media that match the existing material.	Yes	0
		No	100
2	Teachers use learning media.	Yes	100
		No	0
3	The teacher has been helped in conveying the material by using learning media.	Yes	100
		No	0
4	Learning media that have been applied have helped and supported learning activities.	Yes	100
		No	0
5	Teachers have needed learning media that are already available in schools.	Yes	100
		No	0
6	Students need learning media that can support self-learning when studying at home.	Yes	50
		No	50
7	Teachers have used Instagram in learning activities in class.	Yes	50
		No	50
8	The teacher has used learning media in the form of Instagram.	Yes	100
		No	0
9	Teachers have an interest in using Instagram as a supporting learning medium.	Yes	100
		No	0
10	Instagram-based learning media on acid-base material in everyday life with a multi-representational approach needs to be developed.	Yes	100
		No	0
11	Learning media using Instagram feeds and video reels can increase student learning interest.	Yes	100
		No	0
12	Learning media in the form of Instagram to increase students' interest in learning acid-base materials in everyday life with a multi-representational approach.	Yes	100
		No	0

This study uses a qualitative questionnaire. The data obtained is presented in a usual manner representing the results of filling out the questionnaire. Based on the data in Table 6, the points of the learning media used during the previous lesson can be seen.

The teacher has no constraints in terms of determining the material. The teacher entirely agrees that learning media supports and facilitates learning activities. The teacher wants different learning media to add variations to existing learning. Existing learning media provide an overview of abstract chemical material (Pratiwi et al., 2020). Learning media innovations must be carried out to increase the variety of learning and keep up with current developments (Agusti et al., 2021).

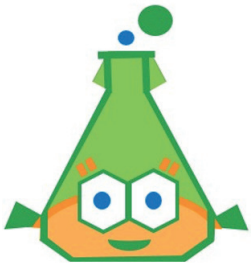
The teacher conveys the need to develop learning media that students can access independently at home. Instagram is indeed something that teachers have yet to use. It is proven that 50% of teachers have used Instagram to help the learning process, even if only a few times. Teachers have an interest in using Instagram, primarily because of the students' high interest in using Instagram. Learning media in the form of feeds and video reels can also be recognized by teachers as attracting students' interest in learning. All teachers are also interested in using Instagram as a learning medium in acid-base materials. An attractive and supportive visual appearance makes it easier for students to gain a complete learning experience and understanding of chemistry material (Safitri & Kabiba, 2020). In addition, the video becomes interactive multimedia with audio-visual elements to actively involve user responses (Hasibuan & Napitupulu, 2021). Instagram is an alternative that can facilitate teachers in explaining material because it can display interactive infographics and videos (Ye et al., 2020). The material analysis process was carried out to map the core and essential competencies of the acid-base material. Existing learning indicators will be described more in correlation with the material so that the content displayed on the Instagram account meets the appropriate learning requirements and criteria.

Results of Design Stages

The design stage is to determine the right visuals to support acid-base learning materials in everyday life. The multi-representational approach demands a description in the form of a microscopic image of a phenomenon or the molecules that make up an existing object. The resulting designs are in the form of images or feeds and video reels that have been captioned. The application used in editing feeds and video reels is Canva.

An Instagram account certainly requires a logo as branding for learning media products that students will recognize. The logo and account name will be the primary display when students access Instagram. A logo can create consistency for Instagram-based social media learning accounts (Adir et al., 2014). A unique and distinctive logo can help the Chem Squad account differentiate itself from similar accounts on social media (Ad"r et al., 2012). The Chem Squad logo can visualize values and messages through learning accounts. This Chem Squad logo design reflects a fun and meaningful chemistry learning topic or goal (Lencastre et al., 2023).The following results from making the Chem Squad logo are in Table 7 below.

Table 7. Logo and Account Name

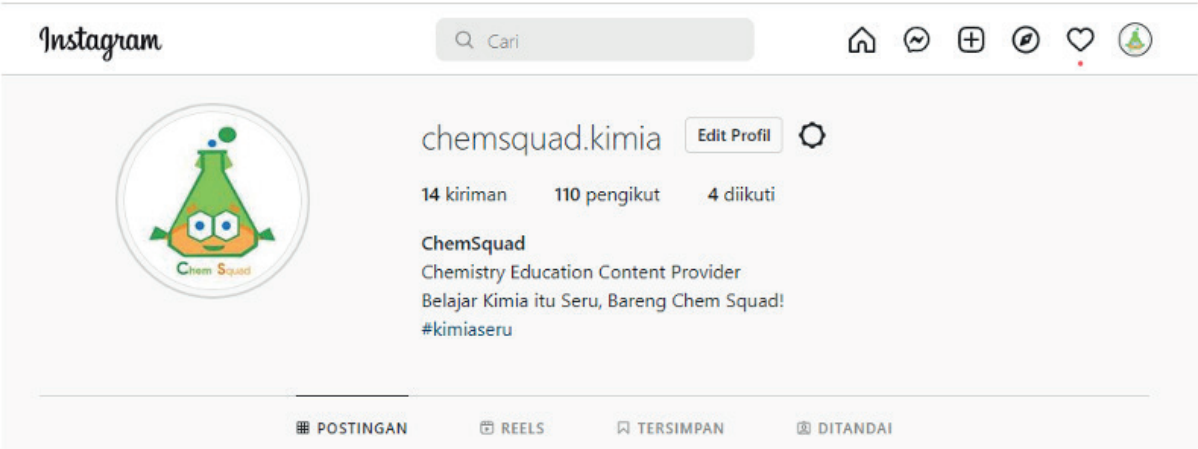
Number	Name	Picture	Information
1	Logo		Chem Squad logo: 1. Reaction Tube, which symbolizes chem squad as a container to explore chemistry. 2. The formula for the benzene compound illustrates that chemistry is complex but can be presented easily through this chem squad learning account. 3. The bubble image above the test tube shows that a reaction occurs in the tube, so Chem Squad will help students take action and care for the environment. 4. Smiling expressions and open arms indicate that chemistry is very open to innovation and can be learned in a fun way.
2	Logo	Chem Squad	The Chem Squad or Chemical Troop is a place for students to learn chemistry in an easy and fun way.

The Instagram feeds and video reels that have been made will later be uploaded to the Instagram account periodically for one week. Students can use this learning media as an additional resource besides the existing books and worksheets. Learning content uploaded regularly can increase follower engagement (Ezaldeen et al., 2023). Consistent learning posts can encourage comments and likes and increase user interaction (Dutt, 2023). Postings will be scheduled according to students' free time to access learning content (Gu et al., 2023)s.

Development Stage

The development stage is to create an Instagram social media account. At this stage, a particular Gmail account was created for learning with the name chemsquad@gmail.com. After that, register an existing Gmail to create an Instagram account with the name @chemsquad.kimia and add a brief description of the Chem Squad account explanation, namely "Chemistry Education Content Provider Belajar Kimia itu Seru, Bareng Chem Squad! #kimiaseru".

Figure 1. Chem Squad Instagram Account Profile



Quantitative data obtained in this study contains input and suggestions for improving media and learning media materials. The validation stage aims to ensure the validity of learning media before being tested on students at school. Media validation was carried out by expert validators in media and material by high school chemistry lecturers and teachers.

The results of material validation in learning media will be calculated on average to determine the accurate representation of the final results. The results of this validation contain two aspects of the data: quantitative data derived from the results of the Linkert scale and qualitative data derived from expert validator comments. The validation of this material concerns four aspects: content feasibility, language, correctness, and use of Instagram. More concisely, the results of data recapitulation are presented in Table 8 below.

Table 8. Results of Material Validation by the Validator

Criteria assessed	Validators			Expected total score	Total empirical	Percentage	Criteria
	V1	V2	V3				
1. Main View							
a. The attractiveness of the Instagram interface display	5	4	5	15	15	93,3	Very Worth it
b. The suitability of the color combination and image object with the background	5	5	5	15	15	100	Very Worth it
c. Clarity of font size and shape	4	4	4	15	13	80	Worthy
d. The appropriateness of the placement of the text	5	4	4	15	13	86,67	Very Worth it
Main View Eligibility Average Results						89,99	Very Worth it
2. Image Display							
a. The shape of the image on the Instagram feed	5	4	4	15	13	86,67	Very Worth it
b. Form images in stories and learning videos	5	4	4	15	13	86,67	Very Worth it
c. Image size	5	5	4	15	14	93,3	Very Worth it
d. Image variations	5	4	5	15	14	93,3	Very Worth it
Image Display Feasibility Average Results						89,98	Very Worth it
3. Post View							
a. Title writing	4	5	4	15	13	86,67	Very Worth it
b. Font size in writing	4	5	5	15	14	93,3	Very Worth it
c. Clarity of writing	4	5	5	15	14	93,3	Very Worth it
Image Display Feasibility Average Results						89,98	Very Worth it
4. Instagram accounts are used in acid-base learning in everyday life with a multi-representational approach		5	4	5	15	93,3	Very Worth it
Percentage of Feasibility of Material in Learning Media						90,54	Very Worth it

The results of the material validation for the development of Instagram-based learning media reached 90.41%. According to (Seftiana & Delia, 2021), the validation value in the 81.00% to 100.00% range is very feasible, so it is classified as very valid without revision to be used for trials. Based on research (Rohmah, 2020) that Instagram has supporting features that users can carry out teaching and learning processes virtually. This feature consists of post feeds and Instagram TV, which can spoil users to continue surfing on Instagram.

The feasibility of learning content must meet several predetermined criteria, namely, the material's accuracy, suitability, and completeness. Content eligibility has a scoring result with a percentage of 91.42%, so it is classified as very feasible, valid, or can be used without revision. Instagram-based learning content continuously provides information related to acid-base material based on trusted references (Agusti et al., 2021).

The language's feasibility is compatible with using commonly used Indonesian language rules. This Instagram-based learning media must be reflected in the excellent and correct writing systematics by PUEBI. Good learning media must meet the terms and conditions set by the Ministry of National Education regarding legibility, straightforwardness of information, and conformity with the correct and proper use of Indonesian (Arsanti, 2018). The feasibility of the concept of Instagram-based learning media has met the standard of eligibility for the concept of acid-base material in everyday life by KD and KI learning. The basic concept of standard material will impact the ease of students learning science correctly (Sappaile, 2019).

The aspect of visual feasibility in presenting learning material in an interactive and structured manner based on a series of existing materials. In addition, learning media that displays images will greatly support existing learning media. In addition, learning media that displays images will greatly support existing learning media (Adawiyah et al., 2021). Based on research (Arifuddin & Irwansyah, 2019) that learning videos help students get an overview of material visually and auditorily. They can increase students' knowledge of the material presented by the teacher.

The data from media validation results from the average validator shows quantitative and qualitative data, which must later be processed to represent the final results of a study. The validator will assess the media from several aspects, namely the principal appearance, images, writing, and Instagram interviews. The following is the result of value recapitulation, which can be presented in Table 9 below.

Table 9. Results of Material Validation by the Validator

Criteria assessed	Validators			Expected total score	Total empirical	Percentage	Criteria
	V1	V2	V3				
1. Main View							
a. The attractiveness of the Instagram interface display	5	4	5	15	15	93,3	Very Worth it
b. The suitability of the color combination and image object with the background	5	5	5	15	15	100	Very Worth it
c. Clarity of font size and shape	4	4	4	15	13	80	Worthy
d. The appropriateness of the placement of the text	5	4	4	15	13	86,67	Very Worth it
Main View Eligibility Average Results						89,99	Very Worth it
2. Image Display							
a. The shape of the image on the Instagram feed	5	4	4	15	13	86,67	Very Worth it
b. Form images in stories and learning videos	5	4	4	15	13	86,67	Very Worth it
c. Image size	5	5	4	15	14	93,3	Very Worth it
d. Image variations	5	4	5	15	14	93,3	Very Worth it
Image Display Feasibility Average Results						89,98	Very Worth it
3. Post View							
a. Title writing	4	5	4	15	13	86,67	Very Worth it
b. Font size in writing	4	5	5	15	14	93,3	Very Worth it
c. Clarity of writing	4	5	5	15	14	93,3	Very Worth it
Image Display Feasibility Average Results						89,98	Very Worth it

4. Instagram accounts are used in acid-base learning in everyday life with a multi-representational approach	5	4	5	15	93,3	Very Worth it
Percentage of Feasibility of Material in Learning Media					90,54	Very Worth it

The media validation results based on the data above show a value of 90.54%. Therefore, the learning media developed are feasible, valid, or can be used without revision. According to research (Miftah, 2013), learning media has proven capable of making abstract material concrete. In addition, learning media can generate interest in learning and extrinsic motivation for students to thoroughly understand the material (Pratiwi et al., 2020). The central display aspect with the number of indicators 4 obtains a score percentage of 89.99% which can be categorized as very valid and without revision. The prominent appearance of learning media can support the learning process so that it looks attractive and arouses student learning interest at school or home (Kuswanto & Radiansah, 2018).

The image display aspect with the number of indicators 4 obtains a score of 89.98%, so it is categorized as very feasible. Using attractive images with high quality will make students feel happy using learning media. In addition, classroom learning will be fun, interactive, and easy to use (Damayanti et al., 2021). Based on the results of the display aspect of the writing with the number of indicators 4 obtaining a score percentage of 89.98%, it is categorized as very feasible. A high level of legibility in learning media makes it easy to understand the material. The National Education Standards Agency guides readability in a medium which is one of the essential aspects that must be implemented (Pebriana, 2021).

The results of the material validation in Table 11 related to Instagram learning content that has been completed are feasible based on the validator's directions. Expert validators provide suggestions and comments that are expected to improve learning media more optimistically. The following are comments and suggestions presented in Table 10 below.

Table 10. Results of Comments and Suggestions for Material Validation by Validators

Validators	Suggestions and Comments
V1	• Media on video reels added subtitles to make it easier for students to understand.
V2	• The two formulas of benzene referred to as benzene need to be corrected again.
	• Sulfur, $S_{(g)}$ is described as having an octahedral structure, needs to be corrected.
	• The equation for the conjugate acid-base reaction (slide 7), ammonia and hydrogen ions, needs to be improved, especially the structure of the ammonium ion.
	• The equation for the reaction of Cu^+ oxygen, needs to be corrected.
V3	• The word "substances" needs to be removed and revised.
	• The word "knowing" in the competency achievement indicator is simply replaced inappropriately.
	• The concept map is not correct.
	• The word "how about this" in video reels is replaced with a more standard word (Video Reels number 1).
	• Avoiding chemical words is hard (Instagram feed number 3).
	• Avoid sentences that are less communicative (Instagram Feed number 6).
	• Just delete the word lethal, just delete slide 3, which tells about the formation of sulfuric acid from SO_x gas which reacts with rainwater, slide 5 better tells about the formation of nitric acid from NOx gas which reacts with rainwater (Instagram feed number 7).
	• On slide 4 (HCl (g) + H_2O (l)) using the example of NaOH (s) + H_2O (l) (Instagram feed number 9).
	• Don't write down ½ reaction but immediately write HCl + NH_3 = NH_4^+ + Cl^- (Instagram feed number 11).
	• Slides 5-6 translated into Indonesian (Instagram Feed number 12).
	• Slide 2 (Follow the standard IUPAC writing) (Instagram feed number 14).
	• Add an explanation of what kind of bad impact it caused (Instagram Feed number 28).

Comments and suggestions that expert validators have given regarding learning content material to fix deficiencies so that the Instagram-based learning media that is developed can be improved. The results of the final refinement of the learning media can later be used directly in trying out the learning media for students. These comments and suggestions are presented in Table 11.

Table 11. Results of Media Validation Comments and Suggestions by Validators

Validators	Suggestions and Comments
V1	•
V2	• Images on the Instagram feed are replaced with local, non-European nuances.
V3	• Adding words after progress and given appropriate image illustrations (Instagram feed number 9).
	• Slide 4 deleted only (Instagram feed number 15).
	• The video needs to show illustrations of vegetables, flowers and tubers (Instagram Video Reels number 23).
	• The scene with the video is synchronized with the story being told (Instagram Video Reels number 27).

Then revisions were made to the learning media in the form of Instagram feeds and video reels, which function to perfect Instagram-based learning media so that they are ready for use. Learning media will already be equipped with captions and hashtags that support disseminating learning content on Instagram social media.

Implementation Stage

Field trials are carried out when the learning product has been completed based on comments and suggestions at the material and media validation stages. The purpose of implementation is to find out how there is an increase in student learning interest in class XI MIPA 1, 3, and 4 as many as 89 students before and after using learning media. Students who carry out the implementation of this learning media have relatively varying levels of ability. The trial lasted two weeks, from Friday, 14 January 2022, until Friday, 28 January 2022. The schedule for posting Instagram feeds and video reels is carried out twice a day, namely at 12.30 WIB and 17.00 WIB. In this trial, students were asked to use and access the @chemsquad.kimia account from start to finish. Students are introduced to using Instagram accounts at the beginning of the week and then fill out an interest in learning questionnaire before the trial. The learning process using Instagram is carried out independently using each participant's mobile phone.

The research results related students' learning interests before and after using learning media. This data is obtained from distributing a learning interest questionnaire which students will fill in before using the media, accompanied by a brief explanation of the background to creating innovation and how to use learning media. After one week, students use Instagram-based learning media and fill out an interest in learning questionnaire after the trial. The results of the before and after tests will be compared, and calculate the standard gain, as well as interpreted data describe the results of interest in learning, including low, medium, or high. The results of the interest in learning questionnaire are as follows in Table 12.

Table 12. Results of the Study Interest Questionnaire

Number of Average Questionnaire Scores		Gain Standard	Category
After	Before		
56.51	74.13	0.40	Medium

Based on the study results, the average student experienced an increase in gain in the medium category, with details in Table 13.

Table 13. Results of Analysis of Student Learning Motivation Gains Based on Number of Students

Number	Normalized Gain Value	Interpretation	The number of students
1	-1.00 ≤ g < 0.00	There was a decline	0
2	g = 0.00	Still	5
3	0.00 < g < 0.30	Low	27
4	0.30 ≤ g < 0.70	Medium	41
5	0.70 ≤ g < 1.00	High	16

Data on interest in learning chemistry consists of questionnaires before and after using Instagram as a source of independent learning. Learning motivation data is qualitative data converted into quantitative data with a two-questioner scale with "yes" and "no" answers. Data on interest in studying chemistry were then averaged for each respondent. The data from filling out the motivation questionnaire before and after using Instagram media was analyzed using gain standards to see improvements.

The results of the motivation questionnaire before using Instagram media showed an average value of 56.51 with medium criteria. This average result is lower when compared to the results of the motivation questionnaire after using Instagram media, with an average result of 74.13. The average results were then analyzed with standard gain showing a result of 0.40 in the medium criteria. This increase shows that Instagram media can provide independent learning for students to increase learning motivation. Students are interested in Instagram-based learning media because it is a viral social media among the younger generation. Many students spend much time on these platforms to interact with friends, follow accounts they are interested in, and get the latest information. Based on data, there are 109.33 million Instagram users in Indonesia as of April 2023. This number has increased by 3.45% compared to the previous month, which was 105.68 million users (Shellanabilla et al., 2022). Regarding age, 38% of Instagram users in the country are in the 18-24 age group. As many as 30.1% of social media users are from the 25-34 age group (Hafidz et al., 2017).

Students are highly interested in Instagram as a visual-based platform that displays images and videos (Gomez-Ortiz et al., 2023). The power of this visual can attract students because humans tend to more easily remember and understand information presented in visual form (Smelhausova et al., 2022). When information is taught through exciting images or videos, students tend to be more engaged in learning. The use of audio-visual media can increase the learning activities of the class (Rosa-Castillo et al., 2022).

Instagram can be accessed anytime, so students can access learning materials, assignments or discussions whenever they want (Richter et al., 2022). Instagram can help students with busy schedules or in a different time zone than the teacher (Lovina et al., 2021). Learning material is delivered through a platform they are familiar with and use daily, making students interested in learning (Indrawati, 2021). This flexibility is crucial in distance education or e-learning. Students from various parts of the world can access learning materials without being in the exact physical location (Gomez-Ortiz et al., 2023).

An everyday life-based approach can teach students how to use chemistry concepts to solve everyday problems, such as choosing safe chemical products for home use or understanding the impact of chemicals in the environment (Nara & Sata, 2016). Life-based learning can help them develop beneficial problem-solving skills. When chemistry material is related to everyday life, students are more likely to see the relevance and importance of the lesson in their lives (Laseinde & Dada, 2023). They can relate chemistry concepts to real situations they experience, which can motivate them to learn more deeply. Applying practical methods based on daily life to the science process skills of class XI MIA MAN 1 Mataram students can increase the value of students' science process skills by 84.8% (Astuti et al., 2019).

Calculating the standard gain in the interest questionnaire results for 89 respondents showed an increase from the analysis results in Table 12. Student interest before using Instagram media showed a lower value compared to the results after using Instagram-based learning media. In the standard gain measurement, five students did not experience an increase in results, and 27 students experienced an increase in motivation with low criteria. Forty-one students experienced moderate improvement, and 16 students experienced high improvement. These results show differences in student acceptance of using Instagram-based learning media. This difference is likely due to students having different initial knowledge and abilities. This ability influences the extent to which students can utilize Instagram-based learning media (Yunitasari & Hanifah,

2020). Students with high prior knowledge and skills may be better able to integrate and apply learning material in social media, while students with low prior skills may experience difficulties (Zulkarnain, 2019).

Each student has a different learning style, which is the second reason for differences in the results of research trials. Some students prefer visual learning, while others prefer auditive or kinesthetic learning (Goosen & Steenkamp, 2023). Instagram-based learning media may be more suitable for some learning styles than others, influencing their learning outcomes (Yotta, 2023). The research results on student learning styles for differentiated learning show that class VI students have diverse learning styles. It is proven that students' learning styles are 47% visual, 31% auditory, and 21% kinesthetic (Himmah & Nugraheni, 2023). This difference is a challenge for teachers to implement differentiated learning strategies.

External factors such as environmental disturbances, social pressure, or personal problems can influence student learning outcomes (Ridho'i, 2022). Students who experience stress or disruption may tend to achieve lower results (Langen & Stamov Roßnagel, 2023). Social problems in students, such as bullying, may make it difficult to concentrate on learning (Johansson et al., 2022). External factors that influence the learning outcomes of class VIII students at SMPN 3 Singaraja for the 2018/2019 academic year show that the average percentage of internal factors in the questionnaire is 33.46%, and the average percentage of external factors is 29.45%. The questionnaire results showed that the relationship between family members was 19.588%, the family economy was 13.555%, student activities in the community were 4.182%, and the influence of relationships was 3.029% (Suarmawan et al., 2019).

Evaluation Stage

Based on the implementation stages, the Chem Squad Instagram account must be evaluated for future development. At the evaluation stage, data collection was carried out for suggestions and input from students during the process of using the Chem Squad account. Based on the input and suggestions of students who were confronted with the Chem Squad Instagram account, namely adding guessing material content or QnA about acid-base material in everyday life, giving lots of learning content in the form of videos because it is more interesting, adding other chemical material to Instagram accounts. The comments and opinions of students as a whole are interested and can learn chemistry in a fun way. This research shows that Instagram-based learning media Chem Squad is very feasible to use. The responses and input will be used as a basis for product improvement for further research. Another obstacle when using Instagram-based learning media is ensuring that the content presented on Instagram follows the established curriculum and learning standards. Teachers must monitor and select content carefully. Instagram or other social media use must be relevant to the learning objectives and material being taught. These must be carefully integrated into the learning plan. Students should be assured that all learners have access to the platform and that no one feels left behind because they do not have an appropriate account or device.

CONCLUSION

Based on the research results obtained, the conclusions are drawn as follows:

1. The development of Instagram-based chemistry learning media on acid-base material in everyday life with a multi-representative approach is feasible. The score assessment with an average material value shows a percentage of 90.41%, so it is feasible. The media aspect was declared fit for use with an average value showing a percentage of 90.54%, so it was included in the very feasible criteria.
2. Increasing students' interest in learning after utilizing learning media based on Instagram accounts (Chem Squad) on acid-base material in everyday life with a multi-representational approach shows a standard gain with an increase of 0.40 in medium criteria.

Acknowledgements: We want to thank LPPM State University of Malang for granting research funding for thesis publication. Thanks to all chemistry lecturers at the State University of Malang and teachers at SMAN 3 Sidoarjo.

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AN EVALUATION OF PERSONALIZED LEARNING BY ONLINE INFORMAL EDUCATION IN CASE OF DESIGN EDUCATION

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Received: 25/01/2023 **Accepted:** 11/09/2023

ABSTRACT

The advent of digital technology has enabled the development of alternative learning methods that enable personalized education to meet the demands of the modern era. Regardless of geographical location and time, online education facilitates the provision of personalized learning opportunities through asynchronous or synchronous recording. Thanks to Covid-19, the rapid adaptation of formal education to digital environments promoted individualization and self-directed learning. The increasing use of design software in architectural education due to digitalization promotes integrating synchronous or asynchronous extracurricular training into the individual learning process. By exploring the diversity of informal online education programs in design software, this study aims to identify the contributions and limitations of informal learning in personalization. Examining the context of a five-day online workshop and a 21-day course can provide new perspectives through a multidisciplinary environment of discussion and practice, even in a short period of time. These programs provide education and training for skilled designers who have their own unique perspectives and techniques on design. Participants' economic situation regarding course fees introduces a competitive medium, which restricts learning accessibility in any scenarioMoreover, excluding these educational programs from transcripts due to imprecise evaluation conditions results in unfairness. With equal access and fair and accurate evaluation mechanisms, informal online education can help professionals develop unique, global, and harmonious perspectives.

Keywords: Online informal education, personalized learning, design education.

INTRODUCTION

Education and learning involve a continuous interaction between lifelong experiences since infancy and the acquisition of knowledge from structured and semi-structured environments. A structured learning environment consists of systematically organized courses that determine what is taught during the learning process. Higher education institutes organize formal education into a curriculum of compulsory and elective courses, which are maintained through student-teacher interaction with applied and theoretical courses. While adhering to a set framework, any formal education program provides comparable knowledge and awareness (Hager, 2012). Non-formal education has also been integrated into the curriculum through workshops and courses to promote personal development. By contrast, informal education is an observational, experiential form of learning. Expert-led experiences are considered informal learning, while random learning is the experiences gained in everyday life (Table-1, Association for Cultural Relations, et.al., 2019; Grunzke, 2019; United Nations Educational, Scientific and Cultural Organisation, 2011).

Table 1. Learning materials by education classification (Association for Cultural Relations et.al. 2019).

		Education classification			
		Formal	Non-formal	Informal	Random
Compulsory courses					
Optional workshop, courses					
Experiences by observation and practice	**With experts**				
	Individual				

In addition to the structured or unstructured approach to training, the process also differs depending on the course's training medium, methodology, resources, and tools. Conventional education involves face-to-face seminars, courses, or exercises that require physical materials to facilitate student-teacher relations (Duff, Gilbert, Kennedy, & Wai Kwong, 2002). Literature sources provide information for instructors using passive oral and written instructional techniques in formal and informal education. Using visual and auditory learning tools such as paper and pencil, pupils participate primarily as listeners in this educational process. Digitalization has personalized and globalized learning through customized media, materials, and methods. Through the use of computers and the Internet, an active, collaborative educational environment is created. (Table 2). Data accessibility and online networks enabled the proliferation of learning methods like online education that provide teaching regardless of time and place. During the Covid-19 pandemic, online learning fulfilled the need for courses and classes in our homes. In addition, distance education encompasses virtual environments in which instructors and students interact indirectly through online videos, text, audio recordings, and educational systems (Moore & Kearsley, 2012).

Table 2. Differentiations between conventional and online education (Wasim, Sharma, Khan, & Siddiqui, 2014; Association for Cultural Relations, et.all. 2019; Dolog, Henze, Nejdl, & Sintek, 2004).

	Conventional Education	**Online education**
Medium	Physical Single media	Virtual Multimedia
Material	Literary, oral presentation,	Video, presentation, audio,
Tools	Pen, paper, chalkboard,	Internet, Applications, Algorithm, Deep Learning
Scale	Isolated/Class	Collaborative/Global
Learning	Teacher based Passive learning	Student based Active learning Life-long learning Personalized learning

The designs, created with thoughtful observation and inspiration, aim to develop the creativity and discovery potential of the designers' utopias in the learning domain (Bielefeld & El Khouli, 2021). Design education occurs through active communication in the studio, with constant teacher-student interaction. Digital media don't just provide social and active informal learning environments but also offer multiple trial-and-error

opportunities to acquire different types of knowledge. Design education, an ongoing learning process of research, production, and experience, has been transformed by digital technology to make production faster and easier. Since the beginning of technological development, informal sharing media have been a part of education. While prior publications have suggested that social, observational, and formal learning methods are necessary to enhance student creativity, the COVID-19 pandemic has shown how design education can thrive in a visual environment (Kolb, 1989; Jankowska & Atlay, 2008; Thoring et.al, 2018). However, the impact of shifting stereotypes in formal education comprises all stakeholders in the learning process. Within this scope, the investigation is chiefly focused on how digitization is introduced into the learning process.

Digitalization in Education

In the aftermath of World War II, countries searched for the creation of safety through technological advancements and personalization in social life, manufacturing, health, and education is also brought by them (Mitchell & McCullough, 1994; Commission of The European Communities, 2001). The reflection of digitalization on education is the digitization of existing publications and drawings and their systemic transformation (Brennen & Kreiss, 2016). By digitizing written documents and making them accessible from both on and off-campus, virtual environments help create online repositories (Carpo, 2013). Numerous universities in England, America, and the Nordic countries have established online archives for their publications and academic resources (Thompson, 2013; Dahlstom & Doracic, 2009). Many public foundations also open their archives to all students and academics in order to adapt to the ever-changing educational environment, similar to that of universities. The education process incorporates visual productions such as videos, photography, and sound recordings with online written resource (Moore & Kearsley, 2012). The usage of this created virtual data is highlighted through websites, online programs, applications, algorithms, software, and artificial intelligence in education. Thus, intelligent learning environments enable students to reach the desired information with the information-tool-human relationship under every condition (Brusilovsky & Peylo, 2003; Hamburg, 2021). Hybrid education, which combines virtual learning environments and information technology with face-to-face education, provides a means of personal knowledge management through emotional exchange between instructors and students (Paker Kahvecioglu, 2007; Wang et.al, 2022).

Digital learning media facilitate the formation of a multi-professional network, enabling collaborative communication to enhance modern professional skills and solve 21st-century problems. To achieve shared global goals, individuals combine their interests and abilities with novel knowledge in a personalized learning environment (Chaichumpa, Wicha, & Temdee, 2021; Kalmar et.al., 2020). Moreover, an experiential environment is established by observing and mimicking nature through mobile applications to comprehend the pedagogical adjustment of students to their interests and competencies. This type of learning defined as ambient learning provides informal and non-formal education and benefits from the Internet (Atif, 2010; Bick, Kummer, Pawlowski, & Veith, 2007; Paraskakis, 2005; Tan, Chen & Yu, 2022).

The internet is a crucial element in shaping the process of personal learning. It enables the development of distance and online education through training courses, certificate programs, and workshops, especially for higher education institutions to access virtual education resources such as videos and pictures (Wasim, Sharma, Khan, & Siddiqui, 2014). Distance education systems began with mobile libraries and were advanced by the educational radio and television channels until the internet's invention at the end of the 20th century (Saba, 2003). Since the early 2000s, online education or web-based learning has been perceived as the educational vision of the future and a powerful tool for lifelong learning. The objectives for 2001 included establishing adequate online education infrastructure in Europe along with standardization and training to enhance trainers' knowledge of the digital world and course content creation (Commission of The European Communities, 2001).

Online education has become a thriving industry in the 21st century thanks to the availability of Internet-enabled applications and websites that facilitate applied learning, international education, and professional skill development (Holon IQ, 2021; Wang et.al, 2022). Web-based learning facilitates improved individual learning performance, shorter graduation times, and customized transcripts in formal education. (Maghsudi, Lan, Xu, & van der Schaar, 2021; Xu, Xing, & van der Schaar, 2016; Klasnja-Milicevic, Vesin, Ivanovic, & Budimac, 2011). Online training consists of recorded (asynchronous) or live (synchronous) instruction. Asynchronous instruction is a form of education in which a particular subject is divided into sections and taught regardless of time or place. Synchronous lectures, however, provide a condensed presentation of a specific topic within a certain amount of time. This educational platform offers synchronous and asynchronous training sessions for technology, software, and algorithms to support professional disciplines in design and planning (Tan, Chen, & Yu, 2022; Roque-Hernandez et al., 2021). Thus, qualified works arise from improved learning environments, while competition occurs among businesses (Kim & Park, 2020). Online informal learning allows individuals to access personalized education anytime and anywhere using various tools and materials during Covid-19.

Online Informal Education in Design Courses with "Personalization"

Design education has always emphasized creating original forms through dynamic instructor-student interaction. The education confidently starts by imparting fundamental design principles for spatial perception, then advances towards intricate multidimensional ventures encompassing diverse architectural disciplines. Architectural education develops students' creativity and problem-solving skills, enabling them to showcase original and innovative designs through sketching. Digital tools provide designers with an efficient means of expressing their thoughts, facilitating collaboration and rapid iteration. The implementation of this sketching process involves hand drawing before any software can be utilized (Ataman & Lonnman, 1996; Gonenc Sorguc, Krusa Yemisoglu, & **Ozgenel**, 2018).

In the context of formal education, algorithms, computer-aided designs, and CNC machines are indispensable tools that enable students to skillfully manage materials, equipment, and time in both design and production (Benabdallah, Bourgault, Peek, & Jacobs, 2021). The advancement of education through algorithm integration is being propelled by the utilization of online courses, data storage software, machine learning, learning management systems, and virtual classes with simulations. The ultimate goal of this approach is to significantly enhance the problem-solving skills of students across diverse disciplines (Dolog, Henze, Nejdl, & Sintek, 2004; Sangineto, 2008; Gelsomini, Leonardi, & Garzotto, 2020).

Incorporating "research by design" into workshops is essential to streamline intricate built environment problems and elevate the caliber of architectural education (Sipahioglu, Abbas, & Yilmaz, 2021). The development of digital design tools, workshops, and courses helps students expand their creativity by considering current paradigms of space, humans, and aesthetics. Informal education confidently instills hand drawing and digital design programs to enhance awareness and perception of urbanization while synchronously promoting competition (Turgut & Canturk, 2015; Polatoglu & Vural, 2012; Akcay Kavakoglu, 2015). Both approaches encourage students' motivation and self-confidence and keep them in a constant state of learning.

Online courses are comprehensive educational programs that universities and private online education institutions offer. These programs can be taken either synchronously or asynchronously to cater to the needs and preferences of different learners. The current study delved into the realm of design disciplines related to computer technology, with a specific focus on synchronous online courses and workshops. Numerous prestigious universities across the globe provide certificate programs centered on the domains of 2D and 3D design, as well as design thinking, which encompasses the field of AI and deep learning. These programs are readily accessible through popular online learning platforms (Table 3).

Table 3. Synchonous and asynchronous online courses and workshops related to architectural design

Institue	University-Private	Subject	Learning type	Course / Workshop	Resource
Udemy	Private	Plan & Sketch Programs Physical Modeling Computational 3D Design Design Thinking	Asynchronous	Course	https://www.udemy.com/courses/design/?p=3&search-query=design
Edx	Standford University	Algorithmic Design Production	Asynchronous	Course	https://online.stanford.edu/
Coursera	The Michigan University The University of Melbourne	3D Modeling Design Computing Virtual & Augmented & Mixed Reality	Asynchronous	Course	https://www.coursera.org/search?query=design&
Youtube	MODE Lab	Parametric Design	Asynchronous	Course	https://www.youtube.com/channel/UCFwIL20fwOmTUkxJgOPk5Jg
Rethinking the Future-RTF	Private	Design Learning Design Thinking	Asynchronous Synchronous	Course/ Workshop	https://www.re-thinkingthefuture.com/
Rat-Lab	Private	Computational Design	Synchronous	Workshop	https://www.rat-lab.org/winterschool2020
Black Spectacles	Private	Parametric Design	Asynchronous	Workshop	https://blackspectacles.com/courses/introduction-to-parametric-design-in-grasshopper/
Archistar Academy	Private		Asynchronous	Course	https://academy.archistar.ai/streams/parametric-design
Think Parametric	Private	Modeling BIM Visualization	Asynchronous	Course	https://www.thinkparametric.com/

This research aims to analyze diverse online informal education and highlight their individual and collaborative advantages and limitations in personalized learning through examples that contribute to education design. The inquiry begins with an assessment of the impact of digitalization on the field of education and the progress made in the online learning domain. The second part of this investigation conducts an in-depth analysis of various instances of online non-formal education in design and critically evaluates their respective strengths and limitations. The primary research question of this study is, 'How does developing personalized education through diversified informal online learning platforms contribute to formal design education?'.

METHOD

In-depth research studies have meticulously analyzed the integration of technology in education and the structure of virtual courses (Cox, 2012; Castro & Tumibay, 2021). Additionally, surveys have diligently evaluated the effects of modified training techniques on students (Song & Bonk, 2016; Tan, 2013). On the other hand, the number of studies published on how the design process trains in virtual medium and the outputs of this learning (Ceylan Dadakoglu, 2022; Park, 2011; Lahti & Seitamaa-Hakkarainen, 2014). In

addition to published research, the present study assesses how an online workshop and course curriculum, which is part of informal education, helps to design learning in potential opportunities and challenges. The secondary research method as a part of quantitative research through literature review and case studies, is used to assess the situation (Stewart & Kamins, 1993).

The literature review of this study releases in three parts;

1. What is the process of learning and education, how does it diversify and what is the role of informal education in this process?
2. What has been the impact of digitalization on the education and learning process? How has it evolved? What kind of things have been changed by its development? What has been its impact on personalized education?
3. How has digital learning enhanced design education? What is the impact of diverse informal educational media on design education? How has personalized education developed within design education?

In the second phase, which consisted of three steps, the state of informal education in design learning was studied by sampling. Two forms of informal education, workshops, and digital design courses, are selected in the first step, while the sampling parameters are decided in the second. In this study, the sample selection was based on the duration of the training, with the focus solely on the possibilities of digital training in terms of time use. Furthermore, computational design has been selected as the subject of this study due to its widespread use as a design approach in both educational and professional contexts. According to the similarities and differences, the samples were evaluated for their learning outcomes using a synchronous teaching system, reciprocal thinking, discussions, and assessment methods. Their contributions to formal design education were demonstrated apparent through analysis of their syllabus, which included theoretical or practical training methods, as with the resources provided to students after the program (Figure 1).

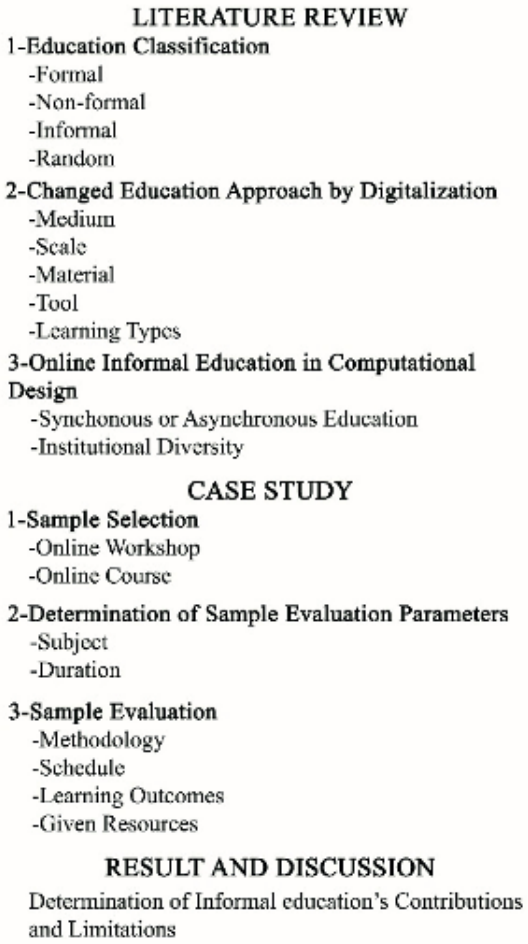

Figure 1. Methodological flow

Data Collection and Analysis

As design becomes digitized, the ability to adapt and change is enhanced, allowing for rapid production across a network of digital links. In addition to the aesthetic considerations of design, the solutions for environmental issues highlight the growing significance of rapid production and encourage designers to think algorithmically. Meanwhile, various design approaches have evolved, such as computer-aided design (CAD), computer-aided modeling (CAM), design computation, computational design, and parametric design (Oxman, 2006).

Digital design tools are increasingly used alongside traditional teaching methods in design education due to changing digital learning mediums, methodology, and materials. As computer-based design courses increase in curricula, design projects are also conducted through digital media. The utilization of design programs by students to create quicker and more variable designs lead to an intense learning interest in different software and a growing competitive environment. In this context, there is an ever-growing demand for extracurricular training options to diversify education and accelerate learning. Short-term training, such as courses, certificate programs, and workshops, allows students to adjust to the evolving digital landscape and shifting production techniques. Workshops, courses, and certificate programs are delivered synchronously in person and are also virtually conducted. Asynchronous and synchronous courses, certificates, and workshops in computational-parametric design have emerged the significance of computer-, algorithm-, or computation-based design in architectural education. In this context, universities or private institutions offer informal education at the initial, intermediate, and advanced levels. Some occur regarding the instruction of specialized contexts and software plugins.

The study analyzed the online workshop "Introduction to Computational Design" held by Driven by Volumes (2021) and the online course "Sustainability through Computational Design" organized by Rethinking the Future (2021) as instances of informal education, assessing their structural and cognitive components. A systematic identification process was created to uncover reliable similarities and differences in outcomes. Several key factors, such as participant preferences, duration of training, and resources required, determine the scope of the investigation process. Also, the potential learning outcomes are estimated based on their objectives and the methods used by instructors (Table 4).

Table 4. Online Workshop and Course samples about architectural design education (Driven by Volumes, 2021; Rethinking the Future, 2021).

	Course	**Workshop**
Name	Sustainability through Computational Design	Introduction to Computational Design
Type	Synchronous	Synchronous
Participations	Student Professional	Student Professsional
Duration	21 day Each section:120 min	5 day Each section: 240 min
Aim	To teach algorithmically thinking by understanding weather data and performing environmental analysis	To establish parametric design methodology by rethinking existing buildings and implementing new structures.
Methodology	1-Lecture 2-Demonstrations 3-Assignments 4-Group activity 5-Discussions	1-Lecture 2-Practices 3-Question & Answer 4-Discussions
Resources	Understanding of Basic Building Science Climate Data and Environmental Factors Algorithmic Thinking by Grasshopper Simulated and analysis of LEED, GRIHA, IGBC necessities	Computational design interface (Grasshopper, Rhinoceros) Data manipulation Patterns & Attractors Modelling + Meshes

1.Section	Introduction to the Course	1.Day	Introduction: Rhinoceros + Course overview
2.Section	Intro to Rhino Assignment 1 Intro to Grasshopper Assignment 2		Break Introduction: Grassopper Geometry Manipulation I Exercise + Q/A
3.Section	Intro to EPW Working with Weather Data Assignment 3	2.Day	Geometry Manipulation II-III Data Manipulation I-II Exercise Break
4.Section	Comfort UTCI Analysis Assignment 4		Data Manipulation II Geometry Manipulation IV Exercise + Q/A
5.Section	Sunpath Analysis Shadow Analysis Assignment 5		Display I Data Association I Fields Data Association II
6.Section	Shading Mast Assignment 6	3.Day	Break Data Manipulation III Data Association III Exercise + Q/A
7.Section	Radiation Analysis Assignment 7		Data Management IO Computation Meshes Break
8.Section	Capstone Project: Discussion	4.Day	Catenary - Kangaroo Interactive & Dynamic modelling Conclusion + Discussion
9.Section	Jury presentation		Utilities + tips + common errors Introduction to loop Iterative modeling Break
10.Section	Lecture and Demo	5.Day	Iterative modeling Iterative modeling Conclusion + Discussion

FINDINGS

Workshop programs that offer individual development through environments, materials, and tools also provide an active, person-centric learning process where individuals have the opportunity to learn by doing and gain a multidimensional and interdisciplinary perspective alongside their peers through collective thinking and discussion (Sipahioglu, Abbas, & Yilmaz, 2021). Although online workshops involve one-to-one interaction, they also involve face-to-face interaction in a virtual environment. Online workshops deliver assignments via email and share their outputs in synchronous virtual meetings on social media (Davies, Seaton, Tonooka, & White, 2021). Workshops can provide fundamental knowledge alongside specialized content for specific fields using a range of topics and methods. Especially with the updated software plugins, the range of educational options is expanding.

Parametric thinking teaches designing through algorithms, except formal design education outputs. Especially with algorithms that enable planning and consideration of multiple variables in the digital environment, the

educational process is facilitated compared to traditional design educational materials. While the concept of production incorporating social, environmental, and aesthetic values is consistently conveyed to students, the intellectual creations of designers are readily embodied in the digital design process with rapid adaptation to shifting conditions. Online workshops accelerate the acquisition of tools necessary for transferring design ideas. With this learning, participants can acquire fundamental skills for applying software to create designs. Later, through independent learning of software plugins, designers are able to tackle the design problem from different perspectives and diversify their representation.

This study examines an online workshop that assesses the teaching of parametric design through the practical use of Rhino and Grasshopper software. The program, which aims to transfer intensive foundational information in person, is conducted over five days, with four hours of training per day. Starting with at least 10 participants from various disciplines, students and experts will participateIn this program, a discussion environment is created through questions and answers. While the synchronous nature of this workshop is advantageous for its hands-on and interactive learning approach, it becomes unavailable to individuals with limited financial capacity, except for recorded Rhino and Grasshopper tutorials. The presence of a debate environment provides an objective evaluation of learning outcomes while allowing individuals to gain multiple perspectives from different disciplines. On the other hand, the online program also promotes customization in professional and public life through the visual exchange of opinions. The absence of personal interaction and a promoter learning environment hinders some individuals who require face-to-face communication and a physical presence for optimal education, thereby restricting learning opportunities. Providing brief breaks maintains focus and simplifies cognitive learning for participants. Besides, it also provides the elimination of technical issues such as internet connectivity problems, sound problems, and visual disconnections. For this workshop, participants prepared by acquiring materials (Grasshopper and Rhino software) and tools (computer and reliable internet connection) instead of relying on the traditional workshop approach organized by the committee.

Plugins developed in design software allow concise, speedy, meticulous, and issue-specific solution proposals. After acquiring fundamental knowledge and skills, this training enables individuals to produce more diverse, efficient, and expedient products within their profession. The course program Sustainability through Computational Design, prepared by Rethinking the Future, seeks to integrate building physiology, environmental data, and computational design in design education. The course program offers a collaborative forum for examining global environmental concerns concerning the built environment, utilizing Rhino and Grasshopper plugins. The training program focuses on enhancing the quality of the built environment by integrating climate data into its design. In the construction process, the contribution of software programs is also conveyed in the design process, considering the appropriate conditions for LEED and GRIHA certificates. The growth of environmental consciousness emerges innovation in education programs that focus on teaching methods and subjects related to creating environmentally friendly architectural and landscaping designs. The program alters the concept of personalized design and aids self-confidence and self-expression in practice and presentation.

The proposed program executes with a maximum of 25 participants, whether students or professionals from various disciplines, for 21 consecutive days, with 2 hours of daily work. Its schedule is more extensive than a workshop and incorporates a long-term plan. However, because of the private subject in training, designers or students who regard the built environment have a higher potential to participateIt establishes a collaborative setting that endorses the conception of working together with a teaching methodology centered on practice and discussion. While conveying basic information about plugins through course materials and instructions, participants are prompted to actively engage through practical assignments at the end of each course. Due to the long-term orientation of learning, the points of confusion about the subject matter clarify more easily. In the context of the course, producing a model project and presenting it in front of the jury qualifies the training for its purpose. In addition, this educational platform provides a network of sharing ideas and collaboration between students and professionals for internship or job prospects. Moreover, the training certificates can be beneficial in persuading the business community. Although informal education, not included in the mandatory education system, distinguishes individuals from others in both their learned design program and the environment they have acquired. Participants in this training demonstrate their awareness of current environmental concerns and their ability to engage in individual and collaborative practices to address these challenges.

Digitization in design recognizes new learning opportunities explored in virtual media, according to the online workshop and course examples. This training teaches how to quickly produce designs using digital networks by considering their social, environmental, and aesthetic values. However, digital design fails to promote socio-cultural values like preserving collective memory, culture, and loyalty to a place. According to mandatory schooling, non-formal programs offer efficient communication of intricate details and swift access to necessary design elements. Thus, it develops better-prepared and more efficient personnel for the sector's needs. The informal learning programs facilitate thorough, straightforward, and rapid analysis of the environment, leading to convenient decision-making based on derived conclusions. If the design that develops through the analysis and discussion of information evaluate as a practical medium, younger designers and professionals encourage to think critically. With an active discussion environment, the programs provide indistinguishably gaining permanent achievements than a formal course. Social and occupational information sharing with the multi-disciplinary medium improves also the reassessing occasions to program outputs. However, the training and learning loop sustains wherever permanent materials and products through visual accessibility in online systems and preserves the right to education by hireless open access. While the collaborative and sharing structure required by contemporary design is available in the digital sphere, individuals concurrently construct private educational environments within informal education. The individual's information demands are satisfied by the educational materials and the application process by the participant. The level of interaction between the trainer and the individual can be as much as the capabilities of the virtual environment allow. While these trainings educate more qualified designers, they cause more lonely and selfish individuals to exist in their lives.

Even though the observed samples in this study are unpaid, the capacity to attend education is limited due to the trainer's initiative. In-person training requires a quota limit to manage one-on-one interactions with participants. The rise in participant numbers necessitates individuals to seek solutions to any challenges. Under normal circumstances, online programs facilitate quicker and more efficient instructor interventions in any issues that may arise. However, although online training expands the capacity limit, the maximum participation is still restricted according to asynchronous training. While this generates a competitive environment between students and professionals, it fosters individualization in the profession. In addition, the presence of paid training inhibits the formation of an inclusive learning environment. The differentiation between reaching conditions and learning resources requires a reevaluation of the approach of "universal education accessibility". At this phase, factors such as variations in individuals' ability to create a conducive learning environment, participation capacity, and accessibility to education owing to economic disparities represent the limitations of informal education.

Considering the variety of materials, methodologies, evaluations, and outcomes in synchronous and asynchronous online education, personalization is an inevitable conclusion in learning. The requirements, practices, and evaluation conditions of each training are unique to its owner. While workshops typically involve the sharing of information, discussion, and summary output in a short period, lectures determine complex outcomes with detailed information and evaluation methods for those findings. In both learning, the methods employed by the instructor and the teaching materials set the stage for the process. Therefore, each education and training program is distinctive, and participants who complete such programs distinguish individuals in the business world. These training programs, which explore design disciplines, offer young designers and professionals the chance to develop contemporary and innovative designs.

While workshops and courses enhance the skills of design professionals, they are excluded from transcripts. As well as restricting involvement in non-formal education, any improvements are still unavailable to enhance mandatory education. The absence of informal education in formal education is predominantly due to the existing distinct structures of each system. Structural uniqueness influenced by the standard of learning achievements and outputs (certificates and products) is based on the evaluation parameters and promotes informality in formal education. In this context, a workshop and course require a comprehensive structure and specific titles to be incorporated into formal education. The display of achieved certificates in the transcript provides information about a designer's qualifications in professional life. Even if this engagement activates the competitive and classifying environment, it enhances the multidimensional approach of the design field regarding personal, social, and global factors (Table 5).

Table 5. Limitations and advantages of online workshops and courses to design education

Advantages	Limitations
Shortten term & Applied-based	Individual material
Complex knowledge bundle	Triggering the competitive medium
Multi-disciplinary	Differences in education approaches
Discussion environment	Unequal certificates
Open-access	Lack of involvement in formal education
Virtual accessibility	Resource accessibility

While workshops and courses present valuable sources to advance design information, their integration with higher education institutes should affiliate with the current education system. When informal programs can be incorporated into formal education, personalized learning will become increasingly prevalent among managers, professionals, educators, and students.

CONCLUSION

While digitalization has transformed the education sector, it has also brought personalization to teaching methods. Visual media triggers physical and cognitive personalization through thinking, discussing, and creative processes. The invention of the Internet has facilitated online and distance education, allowing for synchronous and asynchronous programs to be incorporated into the curriculum. Synchronous informal education that has evolved rapidly since the COVID-19 pandemic heavily triggered personalized learning.

The proliferation of digital design in academia and the professions has promoted the growth of synchronous and asynchronous online informal education outside of curricula. Digital workshops and educational programs provide individuals with focused and practical design training, enabling them to acquire vital knowledge and skills in their field. The interactive learning environment that allows for collaboration, coupled with internet access, provides synchronous training that is preferable to asynchronous training. Online education allows individuals to design their own learning environments, promoting personalization. In addition to the isolation of individuals, online programs are a controversial method of education due to the collaborative, effective, and efficient continuum of communication on the visual screen.

Volunteer-driven, synchronous training unfolds within the economic and social realities of individuals. Limited accessibility creates a contradiction regarding the right to education and its inclusiveness. Personalized knowledge development through online education creates a competitive educational and professional atmosphere. n addition, the course administration methods, materials, assessment, and variety of certificates bring personalization. The absence of certificates within compulsory education impedes the growth and development of informal education. Furthermore, the lack of them in transcripts requires additional effort on the part of the individual to communicate their accomplishments effectively. Informal education programs, which serve as a technique and component of the learning process, are progressively integrating into the conventional education model. The acquisition and application of knowledge are essential components of effective design. The depth of understanding required stems from individual perspectives, experiences, and accumulated expertise. Therefore, informal training that offers personalization is an essential parameter in the emergence of original products in design education.

As a result, the provision of informal education online offers distinct frameworks for personalized learning and concurrently intensifies competitiveness within the education sector. Furthermore, it fosters a perception of collaboration by promoting teamwork, facilitates meaningful discussions, offers convenient access to information, and reinforces compulsory education.

Limitation

Within the scope of the study, the influences of informal learning types that provide personalization were assessed theoretically by observing diverse organizations. The fact that each organization and trainer's approach varies in the training, process, and evaluation bound the objectivity of informal education. These learning types can implement over students and professionals by instructors as experimental-control groups. Observed quantitative results reveal providing an objective perspective on informal design learning.

Acknowledgements: The author acknowledges the support of Assist. Prof. Dr. Aysegul AKCAY KAVAKOGLU pioneered the development of this study.

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