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The Turkish Online Journal of Distance Education

TOJDE

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Dear TOJDE Readers,

Welcome to IODL Special Issue of TOJDE.

International Open & Distance Learning Conference (IODL 2019) was held between14-16 November 2019 at Anadolu University, Eskisehir, Turkey with the participation of 140 national and 125 international researchers. 149 scientific studies were presented in a total of 31 sessions. After the review process, 11 papers were accepted for publication in the IODL Special Issue of TOJDE. 27 authors from 7 different countries contributed to the issue. These countries are Colombia, Indonesia, Japan, Mexico, Thailand, Turkey and Turkish Republic of Northern Cyprus. The articles are ordered alphabetically according to the first names of the first authors.

AN EVALUATION OF CLASSROOM TEACHERS' OPINIONS ON ONLINE MATERIAL PREPARATION TRAINING THROUGH MOOC AND BLENDED EDUCATION MODEL authored by Ahmet ARNAVUT, Huseyin BICEN and Vasfi TUGUN is the first article. The aim of this study is to increase the awareness of primary, secondary and high school teachers regarding Massive Open Online Courses (MOOC) as well as to help them to benefit from these media and to determine their opinions about these courses. In the study, blended training was given to 33 teachers, whereas a complete online course on a formed platform was given to 34 teachers; consequently, the opinions and the success levels of the teachers were compared.

The title of the 2nd article is EDUCATION 4.0: DEFINING THE TEACHER, THE STUDENT, AND THE SCHOOL MANAGER ASPECTS OF THE REVOLUTION. The authors are Beyza HIMMETOGLU, Damla AYDUG and Coskun BAYRAK. This qualitative research aims to determine the school managers', teachers' and students' characteristics of Education 4.0 according to opinions of educational experts. Content analysis is applied to the e data obtained from 10 faculty members selected with snowball sampling The results are expected to operationalize Education 4.0 revolution in education system for the case of Turkish Education System.

The 3rd article NEED FOR ACCREDITATION AGENCIES AS STAKEHOLDERS IN OPEN AND DISTANCE LEARNING: CASE OF "AUDAK" IN TURKISH HIGHER EDUCATION SYSTEM is written by Elif TOPRAK and Asuman Nurhan SAKAR. This paper gives brief history about integration of Turkey to Bologna process that has shaped the quality approach in the Turkish Higher Education System and explains how national accreditation agencies act to enhance quality in higher education. Secondly, a short literature on quality assurance in open and distance learning is provided with concentration on external evaluation by agencies. Thirdly, the interpretation of European Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG 2015) for quality assurance in distance learning/e-learning and the adaptation of accreditation criteria to monitor compliance with pre-determined learning outcomes is elaborated through different models and benchmarks. As case-study, a new association founded in Turkey, AUDAK (Association for Evaluation and Accreditation of Open and Distance Education Programs) is introduced and its standards are discussed with an eye to the related literature and recent developments in Turkish higher education system.

SECOND LIFE: A THREE-DIMENIONAL VIRTUAL WORLD FOR DEVELOPING THAI EFL LEARNERS' ENGLISH COMMUNICATION SKILLS is the title of 4th article, and the author is Hambalee JEHMA. This quasi-experimental research aims to investigate if applying the Second life, a virtual platform, in the English communication classroom is highly effective. Other factors such as the gender differences, the difference of majors of study, and the number of hours spent on computers were also investigated. The Second life has been employed as a research tool in the study for developing English as a foreign language undergraduate students' English communication skills. The data are obtained from 40 undergraduate students from two different majors, social sciences and science, who were studying English course at the university as a compulsory subject. The findings show that students with different backgrounds which were genders, fields of study, and hours of spending the computers have indifferent mean scores in their communication skills.

Kamil CEKEROL and Emin Ozen are the authors of the 5th article titled EVALUATION OF TEACHERS' TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE WITHIN THE FRAMEWORK OF EDUCATIONAL INFORMATION NETWORK AND OTHER VARIABLES. The aim of this study is to examine the relationship between Technological Pedagogical Content Knowledge (TPACK) of teachers teaching at different levels of educational institutions and demographic information about them as well as their technology and Educational Information Network (EIN) use. 364 teachers voluntarily participated in the study by filling out the data collection tool. The results of the study revealed that the teachers find themselves competent in terms of TPACK factors and there are significant differences between TPACK factors and demographic information about the participants as well as their technology and EIN use.

The title of the 6th article is EFFICIENCY OF BIOMETRIC RECOGNITION TECHNOLOGY BASED ON TYPING DYNAMICS IN MOOC. Manuel MEDINA-LABRADOR, Marcela Georgina GOMEZ-ZERMENO and Lorena ALEMAN DE LA GARZA are the authors. The objective of this research is to analyze the independence of the keystroke tool of the other demographic, socio-graphic and behavioral variables within a MOOC, establishing an initial pattern, and two authentication measurements throughout the course. The results show that the keystroke is independent of the ana-lyzed variables, and it is reliable to identify the students in qualitative tests with extension answers.

INVESTIGATING STUDENT SATISFACTION IN ONLINE LEARNING: THE ROLE OF STUDENT INTERACTION AND ENGAGEMENT IN DISTANCE LEARNING UNIVERSITY is the 7th article. Moh. MUZAMMIL, Adrian SUTAWIJAYA and Meirani HARSASI are the authors. This quantitative study utilizing structural equation modelling aims to analyze student satisfaction and engagement effect in online learning which are influenced by student interaction. The results of the study which was carried out in an open and distance learning university in Indonesia indicate that interaction among students, interaction between students and teacher, and interaction between students and content have positive impact on student engagement. The results also show that student engagement has positive impact on student satisfaction.

The authors of the 8th article are Murat Dogan SAHIN, Hakan KILINC and Hakan ALTINPULLUK. The title is AN ANALYSIS OF THE LONGITUDINAL MEASUREMENT INVARIANCE OF THE SOCIAL PRESENCE SCALE DEVELOPED FOR OPEN AND DISTANCE LEARNING ENVIRONMENTS. This study aims to portray the longitudinal invariance of the Social Presence Scale (Çakmak, Çebi & Kan, 2014), which is frequently used to determine the social presence in open and distance learning environments research and has confirmed construct validity in the literature, through repeated measurements obtained in an experimental study. The findings indicate the conditions required for measurement invariance in each stage, or in other words, the longitudinal invariance of the scale was achieved.

Rhini FATMASARI is the author of the 9th article. The title of this article is INTEGRATION OF BALANCED SCORECARD AND SIX SIGMA IN MEASURING OPEN UNIVERSITY ACADEMIC SERVICES PERFORMANCE. This study aims to measure the performance of Open University academic services with the integration of Balanced Scorecard (BSC) and Six Sigma in the field of academic services. Through this integration, performance measurement is focused on quality control by exploring UT's academic service system as a whole and combined with four perspectives in the Balanced Scorecard. The results show that students are very satisfied with UT's academic services which include programs of distance education and programs, models, teaching materials (modules and non-print teaching materials), face-to-face tutorials and online tutorials, learning assistance counselling services, and learning evaluation. Meanwhile, measurement using Six Sigma shows that UT academic services are at level 3, which means there are still some UT services that are not perfect, especially in tutorial and teaching materials services.

The 10th article which is authored by Safinoor SAGORIKA and Shinobu HASEGAWA is titled DESIGN OF VIDEO AIDED RETENTION TOOL FOR THE HEALTH CARE PROFESSIONALS IN SELF-DIRECTED VIDEO-BASED LEARNING. This research proposes to design the Video Aided Retention Tool (VART) system for analyzing video content to improve self-directed video-based learning among Health Care Professionals (HCPs). The VART consists of a combination of video tracking, analyzing, and filtering tools, with the integration of domain model, learners' model, and e-teaching strategy model to aid

in self-directed learning. The proposed VART will pick important videos on a single topic and put automatic indexes to represent the essential parts of video content. It will also track the learner's ID, content preference, monitor watching duration, and repetition of the content. Using such kind of data, attention, and retention will be determined and filtered reels, recommendations, interactive videos will be provided to the learners.

The 11th and the last article is written by Y. Zafer Can UGURHAN, Evrim GENC KUMTEPE, Alper Tolga KUMTEPE and Abdullah SAYKILI. The title is FROM MEDIA LITERACY TO NEW MEDIA LITERACY: A LENS INTO OPEN AND DISTANCE LEARNING CONTEXT. This study seeks to investigate the new media literacy levels of open and distance learners who primarily depend on ICT to access tertiary education. Besides, the study examines the relationship between demographic information of learners and their new media literacy skills.

Hope to meet again in the next issue of TOJDE.

Cordially,

Dr. T. Volkan YUZER

Editor in Chief

AN EVALUATION OF CLASSROOM TEACHERS' OPINIONS ON ONLINE MATERIAL PREPARATION TRAINING THROUGH MOOC AND BLENDED EDUCATION MODEL

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Received: 30/09/2019 **Accepted:** 12/06/2020

ABSTRACT

The aim of this study is to increase the awareness of primary, secondary and high school teachers regarding Massive Open Online Courses (MOOC) as well as to help them to benefit from these media and to determine their opinions about these courses. As a result of the study, the results of the MOOC media through which the experimental group was trained and the blended learning training model of the control group were compared. Therefore, the aim is to provide guidance for the continual discussions about the effectiveness of MOOC. In the study, blended training was given to 33 teachers, whereas a complete online course on a formed platform was given to 34 teachers; consequently, the opinions and the success levels of the teachers were compared. The resulting data of the study was obtained from an opinion scale given to the teachers as well as a media evaluation form. The obtained qualitative and quantitative data were analysed and have been presented in the findings section.

Keywords: Massive Open Online Courses, MOOC, Blended Learning, Teachers, Web Based Learning, Moodle.

INTRODUCTION

The development of technologies used in education affects education media, teachers and also the learners themselves. Only the satisfaction of teachers and learners from these developing technologies would not be sufficient. Therefore, these media and materials should be used so that both learners and teachers can benefit accordingly (Aparicio, Oliveira, Bacao & Painho, 2019). In order to make the currently used Massive Open Online Course (MOOC) media effective, the materials used in such media should be prepared in a conscious manner according to the learner profiles. The MOOC provide people with life-long self-development opportunities. Furthermore, while individuals are improving themselves, they also have new education possibilities through the ability to set their own education durations and times without impacting other areas of their lives (Patterson, 2018). In terms of the teaching profession, those working in this sector need to improve themselves continuously, particularly in this digital era where the students' profiles are continually changing (Bakayev, Vasilyeva, Kalmykova & Razinkina, 2018). The elements required for attracting students' interest and attentions in the classroom would change every day as they meet new

digital tools every day. Therefore, the teachers should choose the path that they will follow carefully in order to increase their educational quality and its efficiency. If it is assumed that the students' interest increases when digital tools are used along with developing technologies, it is evident that if digital tools-device and materials are used correctly in educational media, this can ease teachers' duties.

Massive Open Online Courses (MOOC)

The distance learning approach has developed to the point that MOOC are now available, which are free, open online courses that provide learners the unconditional right to participate as well as being open to everyone (Bozkurt, 2015). The accessible open course resources and social media are also included in MOOC media and those media are the ones of which the user interfaces are provided (Le Counte, Nafukho, Valentin, Johnson & Valentin, 2015). Above all, the MOOC media are designed according to the knowledge levels, skills, interests, desires and learning needs of the learners so that they can organize their own participation (McAuley, Stewart, Siemens & Cormier, 2010). Although widespread participation in open online courses existed in the past, the concept of MOOC first emerged in 2008 (Cormier, Stewart, Siemens & McAuley, 2010).

MOOC have been developed as a result of "Connectivism Theory", which Siemens (2008) defined as the "Learning Theory of the Digital Era". The connectivism theory has arisen based on the developing technology and the changing human lives as a theory which defines learning through networks as a result of the studies conducted in the early 2000s by two Canadian academicians - George Siemens and Stephen Downes (Downes, 2012; Siemens, 2005).

Blended Learning

Unsal (2012) defined blended learning as "a teaching program that is most suitably and specially prepared for a specific group on 'average' level through combining new technologies, activities and facility types". However, Usta (2007) defined it as blended education that benefits from all types of technology and combines various distance and face-to-face learning models in the classroom. Although blended learning is defined differently by many researchers, they agree on the definition that blending learning involves "combining the Internet based education and face-to-face education in the traditional classroom manner". Additionally, the definition accepted in the literature about the blended learning method is "30-80% of the lesson content within the tools as online, implementing the traditional learning method in the remaining time out of this period" (Allen & Seaman, 2014; Porter, Graham, Spring & Welch, 2014).

PURPOSE OF THE STUDY

In this study, the objectives include increasing the awareness of classroom teachers regarding MOOC media and materials as well as their ability to use such media effectively. Also, the data gathered from this study will act as a guide for researchers studying in this field, which is another objective. In order to measure the study productivity, the same training was given again to another group of classroom teachers using the blended learning model.

As well as teaching those models to the teachers in this course, they were asked to implement the things they learned during the course later in their own classrooms with their students. Therefore, the teachers would be able to use those media for their self-development and would also be able to apply the materials and things they had learned during the course in their own teaching practices.

The sub goals of the study are:

1. To determine the proficiency perspectives of the participants in the MOOC and Blended Learning groups before and after the course,
2. To determine their opinions about the prepared MOOC platform,
3. To determine whether they used the MOOC platform before and after the course,
4. To determine whether they will implement the things they learned during the course.

METHOD

In this study, "online material design" training was given to the classroom teachers through the MOOC and blended training methods. As two separate groups, the teachers participated in the training as volunteers. The participating teachers from different schools were assigned to the groups based on a random placement method. The research is a mixed method research where questionnaire was administered to all the 67 teachers that participated and further form were filled in by all participating teachers at various Public Schools.The two group participants were trained on the same subject for a total of 7 weeks. During the course, the teachers were trained in terms of getting an e-mail address, preparing educational videos on the Internet, using the Moodle as both learners and teachers, creating documents and e-books on the Internet and using the cloud media effectively.

Application

While the MOOC group teachers completed the trainings interactively entirely on the Internet with each other and the training leader, the blended training group teachers met with the trainer 3 times a week using in-class media and maintained those trainings by benefitting from the online materials. For the teachers in the MOOC group, the MOOC media was prepared on the Moodle system and all lesson materials were shared on this platform with the participants.

Study Group

This study was conducted in the 2016-2017 fall semester with classroom teachers working in the Turkish Republic of North Cyprus. A total of 67 teachers from different branches, schools and cities voluntarily participated. While 33 teachers from different branches were placed in the blended group, 34 teachers from different branches were placed in the MOOC group. In total, 19 female (57.6%) and 14 male (42.4%) teachers were in the blended training group, while 20 male (58.8%) and 14 female (41.2%) teachers were in the MOOC group. The age of the participating teachers from different schools ranged from 25 to 55.

Data Collection Tools

According to the objectives of the study, the teachers were presented a proficiency perception scale about the effective use of materials on the MOOC platform and their preparation as a learner. Also, in order to determine whether the teachers benefited from the MOOC platform during the course, a platform evaluation form was presented to them which was prepared by the trainer by the end of the course so that their opinions about the media could be obtained. Through the opinion scale prepared by the course trainer, the teacher opinions were obtained regarding whether they would use the materials they had learned during the course in their lessons later.

Proficiency Perception Scale about Massive Online Open Courses of Teachers

Before creating the proficiency perception scale about MOOC, previously created scales about the MOOC were researched in both Turkish and international literature. No scales have been created about the MOOC. This scale will be implemented for the teachers in order to measure the proficiency perception on MOOC in terms of both learners and teachers. The item pool prepared during the scale creation was presented to 7 experts and after obtaining their opinions, the scale initially consisted of 40 items. This scale was administered to 355 teachers. In the first phase, the 40 item-scale was implemented to 200 teachers and then analyses were conducted; subsequently, 10 items that were deemed not to be suitable were removed. The resulting 30-item scale was implemented to 155 teachers and the validity and reliability of the scale was assessed. The analysis results given below were gathered after the scale had been implemented for the last time. Factor analysis was conducted in order to determine the construct validity of the scale. In order to measure the data and sampling numbers' suitability according to the factor analysis, the KMO and Bartlett tests were conducted. The factor analysis is the strongest method in analysing construct validity and enables measurement with a

lower number of factors by gathering together the variables that measure the same quality (Kerlinger, 1973; Ongel, 1975; Tabachnick & Fidell, 1989). According to the evaluation of the results of factor analysis, the factor load values of items on the scale are suggested to be .45 or higher and the emphasis was on paying attention to the high load value on only one factor during the item choice. In order to determine the reliability of the scale, the Cronbach's alpha reliability coefficient of the scale dimensions according to the data was calculated. Since the Cronbach's alpha reliability coefficient is the internal consistency coefficient, the measured variable should be one dimensional. In this regard, a different reliability test was implemented to the scale's first factor and also a different reliability test was implemented to the scale's second factors. While the scale's first factor's Cronbach Alpha coefficient was .946; the scale's second factor Cronbach Alpha coefficient was found as .939 (Tan, 2001; Kiraz, 2003).

The KMO and Barlett test were first implemented to the scale. The KMO and Barlett test show the normality and the suitability for factor analysis. In the analysis after the pre-implementation for the scale, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value was calculated as .639 and since it is >.600, it is meaningful. The Chi-Square value of the Bartlett's test was 15377.924 and the degree of freedom was 435, which indicates that it was meaningful (p=0.00, p<0.05).

Table 1. KMO and Bartlett test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.639
Bartlett's Test of Sphericity	Approx. Chi-Square	15377.924
	Df	435
	Sig.	.000

The Evaluation Form of Teachers for the Massive Open Online Course Media

Attention was paid to particular details when preparing the MOOC media. Many different details can affect the learners' learning process such as the media where the course would be created and the material characteristics. For this reason, the learners' opinions about their course media, process and materials are very important for course experts. A qualitative evaluation form was created in order to obtain the learners' opinions about those criteria. Since all the participants in the blended and MOOC groups followed the same media, the form was presented to all the course participants. The views of 6 experts were obtained for the prepared form for the teachers, necessary revisions were made and lastly, it was implemented to the teachers at the end of the course.

Perception Form about the Course

During the course interview form preparation, the aim was to gather the teachers' opinions about the entire course process. During the course preparation, the main aim was to allow the teachers to benefit from the course as much as possible, to help them learn from the materials prepared during the course in terms of its positive and negative sides, to create their own materials and use those materials during their education as online to support the in-class education. Assuming that the participant teachers would want to improve themselves continuously, the first aim of the course was to use the MOOC as the theme of the course. The other aim was to contribute to either the teachers' life-long learning or to develop it as their hobby. In this regard, the teachers have evaluated the massive open online lessons and its contents in different aspects, the Moodle media established on this course in general, as well as the advantages and disadvantages of the group in which they participated. Five expert views were obtained during the Course Interview Form preparation and the final designed form was given to the teachers after the course.

MOOC Using States of the Teachers

One of the objectives of the study is to increases the teachers' awareness of the MOOC media and to enable them to have continual self-development by using those media. Accordingly, teachers were asked whether they used MOOC media before and after the course in the demographic information section of the proficiency perception scale that had been improved.

Data Evaluation

In order to analyse the meaningfulness of the point differences related to the pre-test and post-test results, the paired sample t-test was used. For the explanation of the data differences, the general average was considered. The reason of the preference of those methods is due to the equal distribution of participant numbers. N Vivo 10 software was used for the gathered qualitative data analysis and they were explored via descriptive and systematic analysis.

FINDINGS

The Proficiency Perspectives of Blended and MOOC Group Participants on Massive Open Online Courses Before and After the Course

The results of the comparison between the proficiency perspectives of the blended and MOOC group participants in terms of the MOOC before and after the course have been given in Table 2.

Table 2. The proficiency perspectives of Blended and MOOC group participants on MOOC before and after the course

Blended Learning Group		N	$\bar{X}$	SS	df	t	p	Explanation
Average Point	Pre-test	33	3.03	.49	32	-9.79	.000	p<0.05 Meaningful
	Post-test	33	3.92	.40				
MOOC Group		N	$\bar{X}$	SS	df	t	p	Explanation
Average Point	Pre-test	34	3.02	.51	33	-13.15	.000	p<0.05 Meaningful
	Post-test	34	4.30	.29				

As the MOOC are a very new approach, they are not widely known. Since they only started to be used in Turkey in 2013, the number of related scientific studies is minimal. It is assumed that usage levels in the Turkish Republic of Northern Cyprus in regard to distance learning are similar, and the pre-test implemented to the participant teachers exhibited low results, which reinforces this expectation. When the results of the pre-test and post-test are compared, it is found that there is a meaningful difference between the two groups (For both groups p=.000, p<0.05).

The Comparison of the Results of Evaluations by the Blended and MOOC Group Teachers

The following table illustrates the evaluation results of the Blended and MOOC teacher groups in regard to the massive open online course media within the scope of the study.

Table 3. Comparison of the results of evaluation by the Blended and MOOC group teachers

	$\bar{X}$	N	SS	t	df	p	Explanation
Blended Learning Group	4.09	33	.21	-.415	65	.680	p>0.05
MOOC Group	4.11	34	.20				No Meaningful

The participant teachers' opinions about the MOOC media were positive in both groups. On average the Blended group ($\bar{X}$=4.09) and the MOOC group ($\bar{X}$=4.11) scored the MOOC media and its materials for the course "Very good". While both groups evaluated the media in terms of different variables, no meaningful difference was found between the evaluation results of both groups (p= .680, p>0.05).

The Blended group participants used this supportive media with the aim of filling in the variable scales and forms and solving the success test; on the other hand, the MOOC group participants followed the entire course from the beginning through this media. In other words, both groups used the media actively for seven weeks. By the end of the course, all the participants had created their own materials and courses on the same platform. In their study Simsek and Turan (2017), researched the usefulness of the MOOC on mobile media and they made suggestions accordingly based on the results in order to increase this usefulness. They evaluated the most commonly used types of MOOC media, such as Coursera, Udacity and Udemy in regard to their usefulness in courses in terms of gender, age, technological literacy and online course experience variables on mobile media. According to the results, statistical differences were found in terms of interface quality, information quality, usefulness and system utility among the evaluated three systems. This study shows that there might be differences in the variables of the most commonly used massive open online course media, such as system utility, usefulness, materials and content.

The Presentation of Frequency and Percentage of State of Using the MOOC by the Teachers before and After the Course

On Table 4; frequency and percentage of state of using the MOOC by the teachers before and after the course have been given.

Table 4. The distribution of MOOC use of teachers before and after the course

MOOC use of teachers	Blended Learning Group				MOOC Group			
	Before		After		Before		After	
	F	%	F	%	F	%	F	%
Using	6	18.2	24	72.7	9	26.5	30	88.2
Not Using	27	81.8	9	27.3	25	73.5	4	11.8
Total	35	100.0	35	100.0	36	100.0	36	100.0

As there has been a positive development in the proficiency perceptions of teachers on MOOC after the course, they also have the same positivity in the state of their using those media. After the course, the participant teachers visited the MOOC media more and registered as members. After the course, the number of participant teachers in the blended group who stated that they would benefit from those media increased from 18.2% to 72.7%. In other words, 24 out of 33 people benefited from the MOOC media. By the end of the course, the number of people in the blended group who continued not to use MOOC media was 9 (27.3%). However, 30 people (88.2%) from the MOOC participant group registered and are now using those media. The number of people in this group who continue not to benefit from MOOC media is 4 (11.8%).

The Blended and MOOC group Teachers' Opinions about Using the Things They had learned during the Course in Their Own Lessons

Table 5 presents the blended and MOOC group teachers' opinions about using the things they had learned during the Online Educational Material Design course in their own lessons in tabular format based on the analysis reulsts, some of the teacher perspectives have been given directly without any changes.

Table 5. The distribution of teacher opinions about implementing the things they had learned during the course

Using the Learned Elements in the Lessons (n=67)	f
The materials used make the learning entertaining	48
I believe that it would motivate my students	58
My students also have the right to benefit from these opportunities	44
It makes learning more effective	55

The Massive open online course materials are materials that are prepared on digital media but could be used in traditional education. The teachers can upload the supportive materials into the MOOC groups in their in-class education and use them as well as creating faster and more effective learning. After the course, the teachers can create their own massive open online course based on the things that had learned during the course and can provide education to learners from all over the world. They can also improve the materials they had learned during the course and integrate them into their class training and motivate the young people during the lessons.

In this direction, the teachers' opinions about using the elements they had learned in their own lessons were asked. The answers show that the teachers were positive about being trained with the massive open online course materials and would like their students to also benefit from those opportunities. According to the conversations with teachers and their opinions during the course, from the beginning of the course, the teachers had already started to use the elements they had learned in their own classrooms. The teachers stated that from the day they had begun to use those methods and materials, the students became more entertained and did not realise when the lesson had finished. They also often mentioned that the students wanted to be trained with those materials on a regular basis. These positive reactions of the teachers are due to the training they received and this was reflected in their students. According to both groups' teachers' opinions, they were very satisfied with the materials, video durations and flow, explanation styles that they mentioned all the time. Due to this increased level of satisfaction, they used the materials in their classrooms, which increased the student motivation and believed that if those who were not using them chose to do so, this would also increase their students' motivation.

The aim of participating in the course was not only to learn, but also to share the elements they had learned with their students and colleagues which are stated by the teachers and they claimed everyone had the right to learn and benefit from the possibilities and technologies. Additionally, they stated that this kind of training was better and more entertaining, which meant that they were highly motivated to use them in their own lessons. Some of the opinions of the teachers about using the elements they had learned during the course in their own lessons are as follows:

> *"…exactly my aim was this when I participated in this course. From now on I am able to prepare richer lesson content and can present to my students through using different media." (Interview form: T42).*
>
> *"…Yes, I am thinking. I already teach by using the available technologies in my school. It grabs my students' attention. With the new technology, the students learn better through being entertained." (Interview form: T59).*
>
> *"…I will definitely use. I believe all the teachers should benefit from these opportunities and provide more quality education." (Interview form: T18).*

"…If the lesson management systems such as Moodle are established in the school, I would like to use them regularly. The subjects that the students don't understand inside the class would be beneficial if they are watched and listened on the computer media later. Also, I am thinking of creating tests on the systems and preparing supportive activities from the external resources." (Interview form: T16).

"…Yes, I am thinking. I would like to have a teaching manner, materials and content that motivate, enliven and entertain the learners so that the education is more qualified." (Interview form: T45).

"…This course in which I participated has made an unbelievable contribution to my lessons, social life and learning. I definitely would like my students also to benefit from those opportunities and their benefits." (Interview form: T31).

"…Especially I would like to use the materials we have learned in my own lessons to present a more qualified educational manner so that it would be more informative for the students." (Interview form: T10).

"…I would like to inform my students during the first weeks of semester about those topics and to use these opportunities during the semester together with my students." (Interview form: T39).

"…I began using the elements I have learned from the first week of the course in my own lessons. Feedback given by students reflected that this has increased their motivation and the lessons have been more interesting." (Interview form: T51).

"…Thanks to this course and media, when we prepare lesson materials, we have more freedom compared to the traditional ones and also we have the opportunity to deliver contents to the students in the out of the lesson times, which helps us improve our teaching jobs. This media and associated materials could motive students more and when they are learning the content, the students are livelier and more entertained." (Interview form: T61).

RESULTS AND DISCUSSION

Meaningful differences were found in terms of the proficiency perception tests that were applied to the Blended and MOOC group teachers before and after the course. The reason for this is that the MOOC are new and they first started being used Turkey in 2013 (Aydin, 2017). Other reasons include that the related studies in this country are very rare and the teachers are unaware of those novelties. It is assumed that the lecturers and teachers working in this country have only been learning and using the MOOC lessons very recently. One of the sub-objectives is to prepare the teachers for this course as both learners and teachers and to enable them to benefit from the courses during their teaching and learning lives. Therefore, according to the results obtained, there is a meaningful difference in the pre-test and post-test comparison of the Blended and MOOC group teachers' proficiency perceptions about the massive open online lessons, which shows that this study has achieved its goals.

In another analysis, it is believed that the MOOC group teachers have more positive proficiency perception states for the MOOC than the blended group teachers, because they followed the whole course through the MOOC media (which was created for this course) and they therefore they were prepared mentally and in terms of their potential abilities

As another objective of the study, the teachers evaluated this prepared massive open online course media in terms of its usefulness and materials. During the course, the teachers created materials that would be used in the MOOC and they were able to see the pros and cons of those media by analysing the MOOC media which, were prepared by both experts and novices in the field. By the end of the course, the teachers were asked to evaluate the MOOC media that had been prepared for them and the obtained data were analysed. According to the analysis, both blended and MOOC group teachers' opinions about the MOOC media and materials were very positive. Both groups of teachers stated that the media was perfectly prepared and there was no meaningful difference between the opinions of both group teachers about the media. Another aim of the study was to increase the teachers' awareness of MOOC and to use them in both their individual and professional development as well as in other subjects. As result of the study, it is possible to say that this objective was achieved.

As a result of the study, it is possible to state that the teachers in both groups made positive progress in using the MOOC. While only a limited number of teachers in the blended group used the MOOC for their self-development, by the end of the course, more than half of the blended group teachers benefitted from those media. Among the MOOC group teachers, while a small number benefitted from those media, by the end of the course, a significant number of the teachers used those media for individual and professional development. The advantage of the materials used in MOOC for the teachers is that they can use them in the traditional teaching style also. Therefore, the teachers were asked whether they thought about using the elements they had learned in the course in an online environment or in traditional lessons. In this regard, it has been found that most of the teachers who started learning these materials began using them in their own lessons from the first day of learning. As both users and the learners, the teachers who gained knowledge from those materials stated that those materials made learning more effective and would motivate students more. The teachers said that they were aware of the new opportunities, effective materials and were satisfied with the training course. Additionally, the teachers noted that the students should be aware of those novelty materials which are necessary because they can receive considerable benefits by using them. In addition to these positive opinions, the teachers mentioned that the MOOC materials made the learning more effective.

FUTURE STUDIES

The MOOC have been considered as the variables of this study which are discussed in conjunction with blended learning, the validity and efficiency of which has been proven by experts. In order to increase the validity of the obtained data, these types of studies should be conducted by comparing the MOOC with different educational models to different samples. Although the same method and technique could be implemented in the future studies, changing the scope and sampling in different countries with more participants would not prevent the results from being compared and also the obtained results would provide guidance for researchers who study in the field of web based education or distance learning. In addition, it can be said that the country where the research is applied, the number of participants and the professional field are among the limitations of the research.

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EDUCATION 4.0: DEFINING THE TEACHER, THE STUDENT, AND THE SCHOOL MANAGER ASPECTS OF THE REVOLUTION

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Received: 19/09/2019 **Accepted:** 12/02/2020

ABSTRACT

In this research, it is aimed to determine the school managers', teachers' and students' characteristics of Education 4.0 according to opinions of educational experts. The study, which is a qualitative one, was designed by using basic qualitative research model. Participants of the study consisted of 10 faculty members, selected with snowball sampling method. Data of the study was collected via semi-structured interview form. To analyze data, content analysis technique will be used. It is expected to operationalize Education 4.0 revolution in education system for the case of Turkish Education System. According to findings, open access, individualized education, mental transformation, integration of digital technologies to education, seamless learning environments, lifelong learning, exploratory education and multidisciplinary education are the main components defining Education 4.0. It was found that the main qualities expected from the students of Education 4.0 are cooperation-communication skills, technological skills, learning skills and personal characteristics. The main qualifications expected from the teachers of Education 4.0 are technological skills, guidance skills, lifelong learning skills and personal characteristics. Lastly, the main qualifications expected from the school managers of Education 4.0 are guidance skills, technological skills, learning skills and technical skills.

Keywords: Education 4.0, teacher, student, school manager

INTRODUCTION

The industrial revolution has led to rapid and radical changes in many aspects of social life such as work, education, management and daily life (Blinder, 2006, p.116). Developments brought by Industrial Revolution have gone through four phases from the mid-18th century until the beginning of 21. Century (Bloem et al., 2014, p.11; World Economic Forum, 2017, p.7). The first Industrial Revolution is called "Machine Age", the second one is "Electricity Age", the third one is "Electronics Age" and the fourth one is "Internet Age" (Peters, 2017, p.34). The 2010s are the years of fourth phase of Industrial Revolution which witness the fastest changes and transformations ever. The fourth phase of Industrial Revolution points to an innovational period which covers cyber-physical systems (Bloem et al., 2014, p.11; Peters, 2017, p.36). The fourth industrial revolutions developing with cyber-physical systems were first suggested by a working group

which consists of the representatives of Academy, industry, and politics in Germany in 2011 with the name of Industry 4.0 (Hermann, Pentek & Otto, 2016, p.3929). The most crucial development lead to Industry 4.0 is the usage of internet in industrial fields (Drath & Horch, 2014, p.57). Cyber-physical systems, which have contributed to development of Industry 4.0, point out the Technologies which increase and enhance human capacity by being a part of daily life (Ballantyne, Wong & Morgan, 2017, p.2). Cyber-physical systems make the concept of "internet of things", which enables "things" or "objects" working connectedly, a crucial concept for Industry 4.0 (Hermann, Pentek & Otto, 2016, p.3929). One of the characteristics of Industry 4.0 is the highest change pace ever (World Economic Forum, 2017, p.7) and the other one is the difficulty of predicting the effects of these changes (Ballantyne, Wong & Morgan, 2017, p.2). Accordingly, it is possible the changes brought by Industry 4.0 will make change necessary for not only production sector but also many aspects of social life.

Small-scale and large-scale changes that occurred during Industrial Revolution period have led to changes that effect almost every aspect of life. As new production features have changed workforce competencies economy demands, social life has obliged to evolve accordingly. Moravec (2013) approaches this situation as Society 1.0, Society 2.0, Society 3.0 correspondingly with Industry 1.0, Industry 2.0 and Industry 3.0. One of the sub-systems in society which was affected seriously from these transformations is education. Accordingly, with changes in the production process and the reflections of these changes on social life, content and concept and content of education have gained new meanings. Some authors have called these transformations education has passed or is expected to pass through as Education 1.0, 2.0, 3.0 and 4.0 (Harkins, 2008; Moravec, 2013). Education 1.0 is a kind of education that meets the needs of agricultural society. Knowledge was used to be transferred from teacher to student and students focuses on teacher's explanations. Education 2.0 is a kind of education system which meets the needs of industrial society. Learning process is focused on acquiring technologies that will be utilized in work life. Education 3.0 has evolved education to meet the needs of society by taking advantage of technology. Lastly, Education 4.0, developed at the beginnings of 21st century is expected to meet needs of innovation age. Students are expected to produce and adapt new Technologies which will contribute development of societies in this process (Puncreobutr, 2016, p.93-94). Education 1.0 is conceptualized as "download education", Education 2.0 as "open access education, Education 3.0 as "knowledge-producing education" and lastly Education 4.0 as "innovation producing education" (Harkins, 2008; Moravec, 2008).

With Education 4.0, Harkins (2008) calls it an innovation producing process, concepts like meaning, technology, teaching, schools, and teacher have been redefined. Accordingly, meaning is built via innovation-focused practices facilitated by individuals or teams. Technology changes continuously with inputs brought by students who have a crucial role in innovation producing process. Teaching is enhanced by positive innovation feedback loops. Teaching, at the same time, gains a continuous occurrence at each moment of daily life, learning life and work life. Schools are situated in human bodies which are globally networked. This position transforms schools an innovative construct which replaces with classroom by continuously evolving. Teachers of Education 4.0 are defined as everybody, everywhere and seen as innovation producing sources.

Education 4.0 can be seen as new paradigm which reinterprets the concepts as learning, student, teacher and school according to needs of Industry 4.0. One of the examples of innovative teaching and learning practices as a part of Educations 4.0 is flipped classroom model. In flipped classrooms, students can investigate lesson-related digital sources such as videos, presentations materials, e-materials out of school and they can acquire the knowledge they need out of traditional classrooms. So, students can utilize classroom time for activities such as discussion, analysis and problem solving (Youngkin, 2014, p.368). Flipped classrooms can be accepted as a blended learning process since this model utilizes online learning materials while transforming traditional classrooms and enhances education process with these materials (Garrison & Kanuka, 2004, p.96; Gogebakan-Yildiz, Kiyici & Altintas, 2016, p.187). So, flipped classroom is a teaching-learning model which makes students responsible for their own learning, is practice-based, gives students individualized education opportunities and gives the opportunity of learning anywhere and anytime. Therefore, it can be said that flipped classroom model is coherent with qualifications of Education 4.0. Flipped classrooms which give the opportunity of blended learning can be evaluated as a mode developed example of Education 3.0 and distance education practices. During Education 3.0 process issues like how to integrate education and

technology, how to include technology in present educational programs which are already very crowded and intense or how to overcome inconsistency between schooling and information Technologies were discussed (Ballantyne, Wong & Morgan, 2017, p.4; Collins & Halverson, 2010, p.19; Sendov, 1987, p.193). However, answer of question as which educational and managerial practices are needed for education 4.0 is so abstract and beyond satisfactory.

Education 4.0 can be seen as a new paradigm which reinterprets the concepts like learning, student, teacher and school according to needs of Industry 4.0. One of the examples of innovative teaching and learning practices as a part of Educations 4.0 is the flipped classroom model. In flipped classrooms, students can investigate lesson-related digital sources such as videos, presentations materials, e-materials out of school and they can acquire the knowledge they need out of traditional classrooms. So, students can utilize classroom time for activities such as discussion, analysis, and problem solving (Youngkin, 2014, p.368). Flipped classrooms can be accepted as a blended learning process since this model utilizes online learning materials while transforming traditional classrooms and enhances education process with these materials (Garrison & Kanuka, 2004, p.96; Gogebakan-Yildiz, Kiyici & Altintas, 2016, p.187). So, flipped classroom is a teaching-learning model which makes students responsible for their learning, is practice-based, gives students individualized education opportunities and gives the opportunity of learning anywhere and anytime. Therefore, it can be said that flipped classroom model is coherent with qualifications of Education 4.0. Flipped classrooms which give the opportunity of blended learning can be evaluated as a mode developed example of Education 3.0 and distance education practices. During Education 3.0 process issues like how to integrate education and technology, how to include technology in present educational programs which are already very crowded and intense or how to overcome inconsistency between schooling and information Technologies were discussed (Ballantyne, Wong & Morgan, 2017, p.4; Collins & Halverson, 2010, p.19; Sendov, 1987, p.193). However, answer of question as to which educational and managerial practices are needed for education 4.0 is so abstract and beyond satisfactory.

Education is one of the most important tools in providing human skills needed as a result of economic, social and technological transformations of the 21st century. In this context, issues as Education 4.0, which emphasizes an education that will raise the producers and users of Industry 4.0, innovation in education and the acquisition of innovation skills through education are discussed. One of the topics emphasized within the scope of education that will raise individuals of Industry 4.0 is 21st-century skills. 21st-century skills are classified under various titles such as individual skills, interpersonal skills, life skills, applied skills, labor skills, non-cognitive skills (McComas, 2014, p.1), learning and innovation skills, knowledge, media and technology skills, life and career skills (P21, 2009). 21st-century skills, which emphasize innovation and learning skills as well as social, affective skills, have similar characteristics with educational content aiming innovation producing. However, studies and discussions about which educational and managerial processes and practices should be implemented to equip students with those skills are still going on.

21st-century skills, which are aimed to be gained through education, and the concept of innovation that has been discussed in the field of education since the mid-2000s, reflect the transformations expected from education by Industry 4.0. These transformations clarify the content of Education 4.0 and lead to redefining the educational concepts, processes, and practices. The formation of a theoretical structure about education 4.0 for putting it into practice can be evaluated as an important requirement for the transition of societies to Industry 4.0 and for their economic growth and social development. However, there are very few studies which discuss the theoretical structure of Education 4.0 both in Turkish (Yildiz-Aybek, 2017) and in foreign literature (Harkins, 2008; Peters, 2017; Puncreobutr, 2016; Wallner & Wagner, 2016). Also, these very studies take Education 4.0 at a very abstract and at only theoretical level. However, taking into consideration that the subjective, cultural and economic structure of the societies and the unique characteristics of their educational systems, it is thought that the content and characteristics of Education 4.0 are needed to be operationalized to direct the implementation. Thus, concrete implementation proposals would be developed to facilitate the transition to Education 4.0 in accordance with the structure and functioning of the Turkish education system. In addition, determining characteristics of Education 4.0 would contribute to the related literature. In this context, it is aimed to determine the characteristics of school manager, teacher and student aspects of Education 4.0 according to the opinions of experts on educational sciences in this study.

METHOD

Research Design

Qualitative research method was used in the study which examined the reflections of Education 4.0 concept in education. Qualitative research process is utilized for drawing a detailed and realistic picture of phenomena or events by using qualitative data collection methods such as observation, interview and document analysis (Yildirim & Simsek, 2011, p.39). Basic qualitative research design, one of the qualitative research models, was used in the study. The aim of basic qualitative research, which is the most widely used qualitative research design in education, is to examine how individuals interpret their experiences, how they build their perceptions of the world and what meanings they attach to these experiences (Merriam, 2009, p.23). In this study, it was decided that the basic qualitative research design was the most appropriate design since it was examined how faculty members who are experts in the field of education make sense of the concept of Education 4.0.

Participants

The study group of the research consists of 10 faculty members working in Anadolu University Faculty of Education and Faculty of Open Education in the 2019-2020 academic year. To form the study group, snowball sampling method was used. Snowball sampling is an effective sampling method to reach critical situations or people from whom more detailed information can be obtained (Patton, 2014, p.237). In this research, participant faculty members were selected as participants by snowball sampling method to reach individuals who are have prior knowledge about Education 4.0, a relatively new concept for education world. The study group consisted of 10 faculty members, 5 of whom work in the Educational Sciences Department of Faculty of Education and 5 of whom work in the Distance Education Department of the Faculty of Open Education. The ages of the faculty members in the study group are between 29 and 59; seniority of them varies between 2 and 20 years. 3 of the faculty members are women and 7 of them are men. 2 of the faculty members are professors, 1 of them is an associate professor doctors, 4 of them are assistant professor doctors, 1 of them is a lecturer doctor and 2 of them are research assistants.

Data Collection and Analysis

Data of the study was obtained through a semi-structured interview form. Semi-structured interview is a very useful data collection tool because of structured enough to emphasize certain aspects of the research problem and flexible enough to allow participants to present new meanings for the study topic (Galletta, 2013, p.1-2). In this study, Education 4.0 at schools was examined in terms of the human capital aspect and so the interview form was structured accordingly. During the preparation of the data collection tool, literature was reviewed in detail on Education 4.0. After the literature review, the draft interview form consisted of 5 open-ended questions and probes. The draft form was rearranged with respect to the expert opinions received from two faculty members in the Department of Educational Administration. Semi-structured interview questions formulated with expert opinions are as follow:

1. How do you define Education 4.0?
2. How do you define the teacher of Education 4.0?
3. How do you define the student of Education 4.0?
4. How do you define the school manager of Education 4.0?

Before the interviews, voluntary faculty members were called to arrange an appointment. Researchers introduced themselves and the purpose of the research to the participants. Questions were asked about the demographic characteristics of the participants. Then, researchers asked open-ended questions in the data collection tool to participants. The interviews lasted between 25- 35 minutes. In order to obtain detailed information about the questions, interviews were supported by probe questions.

In the analysis of research data, content analysis technique was used. Content analysis is a systematic and renewable technique in which some words of a text are summarized in smaller content categories as a result of

coding based on certain rules (Buyukozturk et al. 2011, p.269). According to Patton (2014, p.453), content analysis is any qualitative data reduction and interpretation attempt to determine the basic consistencies and meanings in a dense qualitative material. Research data were analyzed using NVivo 10 data analysis program. The data of the study were analyzed by two different researchers. Analyses were compared until reaching consensus between two researchers.

Credibility, Applicability, Consistency and Limitations of the Study

Qualitative research, because of its nature and purpose, is different from quantitative research. So, the criteria used to determine the value and usefulness of are different from the ones used in quantitative research (Krefting, 1991, p.214). In quantitative researches, the criteria which make the study scientific are called as validity and reliability. However, since qualitative research focuses on describing a unique case holistically instead of generalizing the results, the concepts of truth value, applicability and consistency are used in it instead of validity and reliability (Krefting, 1991, p.217).

In this study, to increase truth value of this study, some strategies were used such as making intensive and in-depth face to face interviews with participants, reporting findings in detail, explaining how the results were interpreted and member-check. Besides, a detailed literature review was conducted to prepare interview questions and experts were consulted on these questions to provide truth value of the study. Other precautions taken for truth value were making appointments with participants and giving them information about the study before interviews. To make this study applicable, strategies like making detailed explanations on how the interviews were conducted, how the data were obtained and recorded, how the results were combined etc. Therefore, it was tried to give useful information for researchers who will conduct similar researchers. Also, to provide consistency, analyses were made by two independent researchers and the consistency co-efficient of their analysis were calculated according to formula suggested by Miles and Huberman (1994, s.64) was used. So, consistency of the findings was found as .86.

The most important limitation of this study is that participants were chosen among experts working at Faculty of Education and Faculty of Open Education since the Education 4.0 is relatively new subject and only few people have knowledge on it. So, to emphasize technological and pedagogical sides of the subject together, participants were limited with these two faculties' members. Other limitations are about studying with small participants and choosing the participants from mentioned faculties of the same university. These limitations are from the nature of qualitative studies which are generally time consuming and costly. The factors such as needed time, cost and effort made researchers to study with only 10 faculty members of only one university.

FINDINGS

The findings of the study were organized under four titles in line with the sub-questions of the research. The findings were investigated with respect to the views of the faculty members about the basic characteristics of Education 4.0 and the qualifications expected from the student of Education 4.0, the qualifications expected from the teacher of Education 4.0, and the qualifications expected from the school manager of Education 4.0.

Basic Characteristics of Education 4.0

The first sub-question of the study is about the views of faculty members about the basic characteristics of Education 4.0. To get findings for first sub-question, analyses were conducted in line with the answers given by Educational Sciences and Distance Education experts to the interview questions. The analysis results were presented in Figure 1.

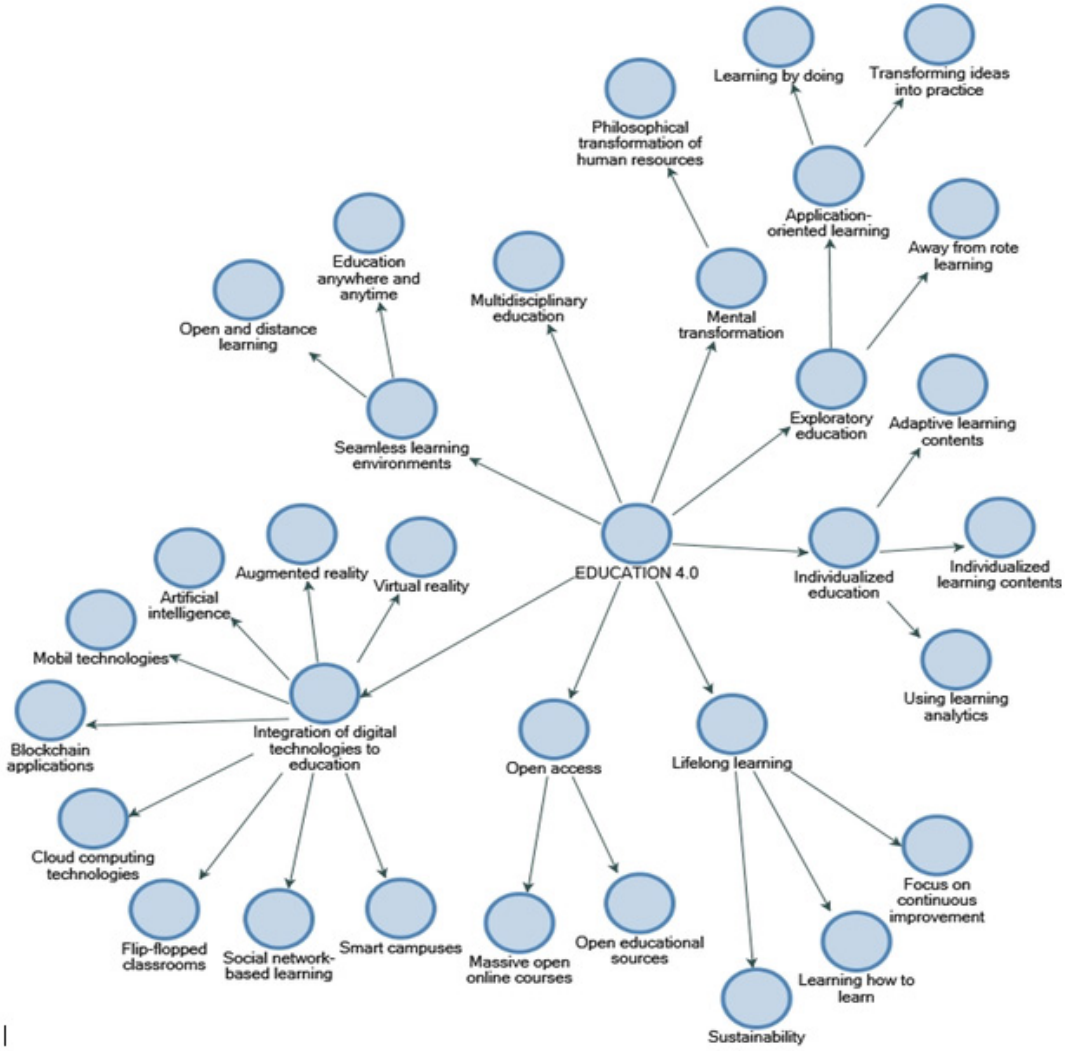

Figure 1. Basic characteristics of Education 4.0

As seen in Figure 1, according to the opinions of the faculty members, the main components which characterize Education 4.0 are open access, individualized education, mental transformation, integration of digital technologies to education, seamless learning environments, lifelong learning, exploratory education and multidisciplinary education. Within the scope of open access, open educational resources and mass open online courses are given as examples. Within the context of individualized education, faculty members mentioned the preparation of individualized learning contents, creating adaptive learning environments and the usage of learning analytics. Within the scope of mental transformation, participants emphasized necessity of philosophical transformation of human resources. Within the scope of the integration of digital technologies to education, suggestions were made for the use of technological innovations such as smart campuses, augmented reality, cloud information technologies and virtual reality in education. Seamless learning environments were explained with learning going out of the classroom and learning anywhere and anytime. Lifelong learning, one of the most focused themes in the context of Education 4.0, was associated with the learning how to learn, sustainability and continuous development. Finally, exploratory education was explained with education away from rote learning and application-oriented learning activities. Some of the statements used by faculty members for the basic characteristics of Education 4.0 are as below:

> *"People are saying that 65% of the jobs we know today will be useless in the near future. In this regard we don't know what kind of qualifications future jobs will demand. It is impossible for us to equip students with qualifications which will prepare them for the jobs of future. So, lifelong learning is crucial and necessary. Sustainability and personal development are also crucial for Education*

4.0. Personal development covers providing individualized learning opportunities students to learn accordingly with their own interest and learning pace." (FM-1)

"Lots of people focus on this side … The most problematic part of the investments is that everything is technology based. But the instrument is changing, environment and media are changing… To say simply, you introduce a Web 2.0 instrument but it doesn't exist 2 years later or what are you doing… An application is put into service with lots of free features for marketing then 1 year later you see that all of these features are sold with a charge. So, we need to provide mental transformation so what I understand from Education 4.0 is acquiring lifelong learning skills." (FM-3)

"Education 4.0 takes the learning environments out of the classroom because it says that learning can be everywhere and anyway. Technologies, especially communication technologies which are with us all the time help us to learn at any time. So, learning becomes information-based rather than memorization because you can do it anytime and anywhere. Briefly, learning in Education 4.0 gets out of classrooms in formal education settings. So, we should raise people adapting themselves to this new age, learning should not be based on only one discipline, but on more discipline. People of this age should be able to see multidisciplinary people of this era." (FM-2)

"I think individualized learning environments will be very important. Because each individual has different needs, different characteristics and different requirements. We are not able to provide an education that meets these requirements yet. In other words, we educate everyone in the same way. The student may be interested in a very different field. He/she cannot be very productive by going through the same education everyone takes. For this reason, a new concept called adaptive learning systems, meaning adaptable to the skills of students have emerged." (FM-5)

The Qualifications Expected from the Student of Education 4.0

The second sub-question of the research is related to the views of faculty members about the qualifications expected from the student of Education 4.0. The findings obtained from analysis are summarized in Table 2.

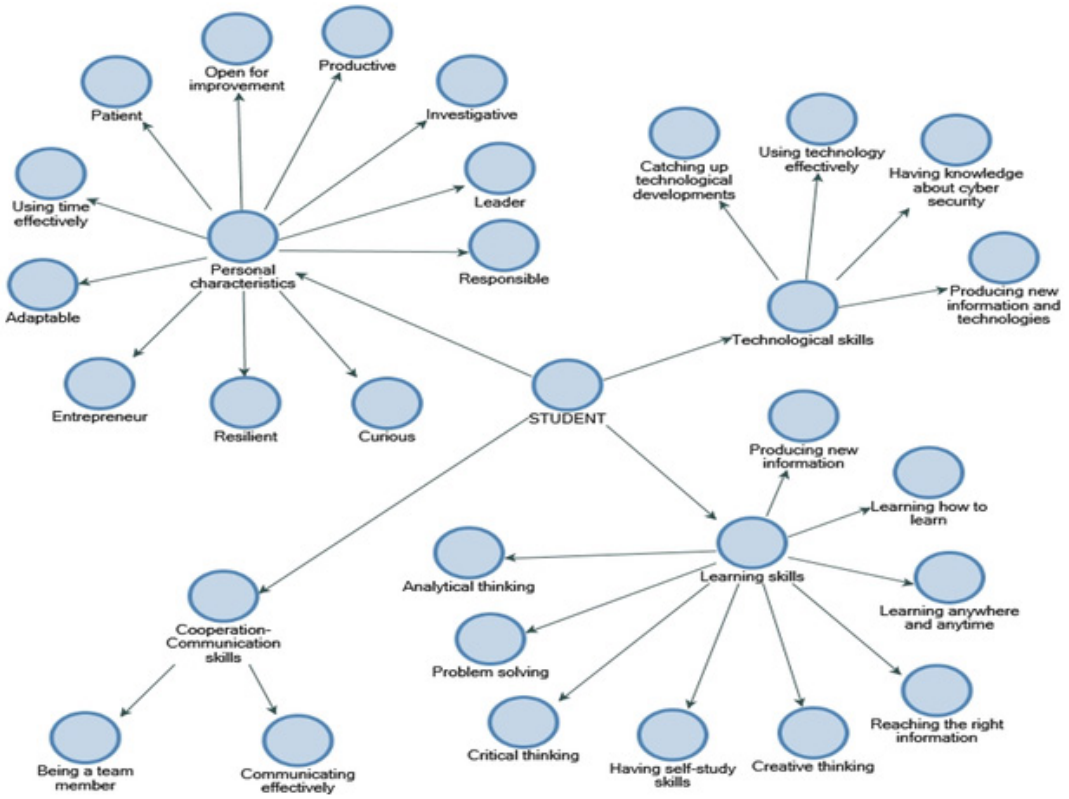

Figure 2. The qualifications expected from the student of Education 4.0

When the findings presented in Figure 2 were examined, the features attributed to the students of Education 4.0 by the faculty members were grouped as cooperation-communication skills, technological skills, learning skills and personal characteristics. Collaboration-communication skills include to be a team member and to communicate well. Within the scope of technological skills, there are technological attitudes and behaviors such as having knowledge about cyber security, producing new information and technologies, using technology effectively and catching up technological developments. Learning skills include the skills that require the student to study, acquire knowledge and use cognitive competences. These include analytical thinking, problem solving, critical thinking, creative thinking, distinguishing between right and wrong information, having self-study skills, learning how to learn, generating new knowledge and learning anywhere and anytime. Within the scope of personal characteristics; being a researcher, entrepreneur, open to development, curious, productive, adaptable, responsible, resilient and leader were emphasized by participants. Some examples of faculty members' views on the qualifications expected from the student of Education 4.0 were as below:

> *"Skills demanded from students are changing. So, they need to be open to change and adaptable. They need to have skills such as problem solving, communicating well, especially virtual communication, managing big data, leading and using technology effectively. One of the most important skills demanded from students is questioning. Now, we need students who questions and criticize information in Education 4.0 instead of downloading it without questioning as in Education 1.0."(FM-1)*
>
> *"The most important qualification of Education 4.0 demanding from students is self-study skill which includes starting to do something on their own and finishing it on their own. Along with that students need to have skills such as working collaboratively and managing time effectively." (FM-7)*
>
> *"In other words, the student should be investigative, open to collaborative works and prone to technology. I think there are not many students who are not capable of technology. Students should have at least information literacy at the basic level. Interpreting and analyzing knowledge are crucial skills for students. The most important things are interpreting, understanding and comprehending knowledge. Otherwise, raw data are no longer useful. Student should know how to reach knowledge very well." (FM-8)*
>
> *"Using technology well can be a desired qualification for students of Education 4.0. In addition, the information has become the product which creating value added for developing countries. On the hand, information will be available by software and coding training. Therefore, students should have skills such as being investigative, problem-solving and creative thinking." (FM-10)*

The Qualifications Expected from the Teacher of Education 4.0

The third sub-question of the study is related to the views of faculty members about the qualifications expected from the teacher of Education 4.0. For this sub-question, data were analyzed in line with the answers given by the faculty members to the interview questions and the findings were presented in Figure 3.

Figure 3. The qualifications expected from the teacher of Education 4.0

When the findings were examined in Figure 3, it was seen that qualifications describing teacher of Education 4.0 were categorized as technological skills, guidance skills, lifelong learning skills and personal characteristics. It was determined that the skills under the theme of technological skills showed similarities with the technological skills of the students. However, technological skills special for teacher of Education 4.0 were determined as managing virtual student groups and integrating technology with learning-teaching processes. Similar to the students, expected personal characteristics from the teacher of education 4.0 were determined as being curious, patient, open to change, adaptable and investigative. For the teacher of Education 4.0, lifelong learning skills were underlined. For this reason, lifelong learning skills for the teacher of Education 4.0, integrated with learning skills, was distinguished as following innovative learning approaches and sustaining continuous professional development. It was determined that the most crucial skills for teacher of Education 4.0 are guidance skills. In this context, guiding students technologically and pedagogically, bonding with students emotionally, coordinating, motivating, leading, creating a participatory learning environment, helping students to reach right information and helping students to set their goals are emphasized. Below are some of the views of faculty members on the qualifications expected from the teacher of Education 4.0:

> *"The role of teacher gains importance gradually in Education 4.0 because teacher is in mentor role now. Teacher needs to have self-improvement skills to guide students for dealing with big data and digital environment, learning how to learn and taking precautions for cyber-security. Teacher should also have skills such as problem solving, leadership, investigative and adaptable. The teacher should not be the person who directs the student and offers the information them, but the person should be who guides them and secures them in a virtual environment." (FM-1)*

"If you think it with a filter metaphor like a security wall or a virus detecting program, we always need teachers. So, the role of teacher will always be important because you can integrate artificial intelligence with information but you cannot integrate it with emotion or cognitive behaviors." (FM-6)

"If the teacher is a mentor, there will be no problem. Teacher should guide students both technologically and pedagogically. Teachers should not say students where they can find information from. For example, students do not know how to use an application. In this situation teacher should have technological competence about it." (FM-5)

"First of all, teachers have to be curious. I think curiosity is very important for teacher of Education 4.0. As I have said, thousands of applications exist. Teachers should search which application is the most suitable for their students. Teachers should wonder and investigate how they can teach better and how they can provide better learning environments for their students. Teachers have to be open to change." (FM-9)

The Qualifications Expected From the School Manager of Education 4.0

The last sub-question of the study is to describe the views of faculty members about the qualifications expected from the school manager of Education 4.0. For the last sub-question, data were analyzed in line with the answers given by the faculty members to the interview questions and the findings were presented in Figure 4.

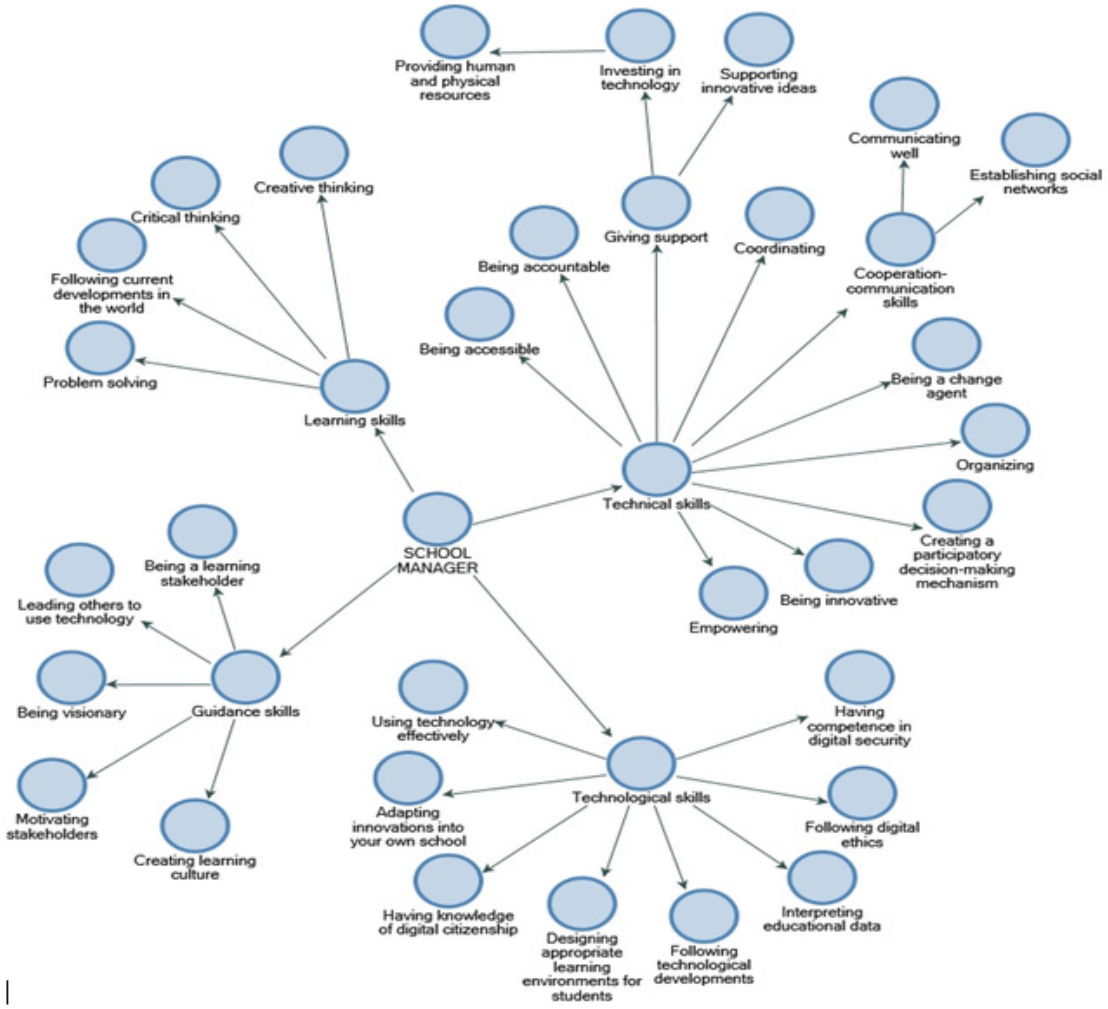

Figure 4. The qualifications expected from the school manager of Education 4.0

When the findings were examined in Figure 4, it was inferred that the characteristics defining the school manager of 4.0 were grouped as guidance skills, technological skills, learning skills and technical skills. Within the scope of the guidance skills of the school manager, which are mostly related with the skills of providing technological guidance at the whole school level, motivating all stakeholders, being visionary, developing the learning culture and leading others to use technology were emphasized. As similar with technological skills for teacher of Education 4.0, school managers' technological skills were determined as following technological developments, using technology effectively, designing suitable learning environments for students and interpreting educational data. Differently, technological skills such as acquiring knowledge about digital citizenship, following to digital ethics and integrating innovations into their own schools were highlighted for school manager. It was found that learning skills like problem solving, critical thinking, creative thinking etc. are common for all school members examined in this study. However, it was found that skills that differentiate school manager from others are technical skills. The technical skills of school manager include their skills based on their expertise in school management. In this scope; the skills included being a change agent, coordinating, cooperating and communicating well, being accountable, being accessible, organizing, operating, empowering and providing support for participatory decision-making processes. Providing support differs from the traditional skills of the school manager in terms of giving chance to innovative ideas to enable technological development and innovation and investing in technology by providing the necessary human and material resources. Some of the views of faculty members on the qualifications expected from the school manager of Education 4.0 are presented below:

> *"…so you have to be a like a maestro to make teams work in coordination, in harmony. In this regard, leader should achieve the thing among teachers, society and students which a teacher tries to make in collaborative classroom environment." (FM-3)*
>
> *"…besides I don't think that technical skills of school principals should be about Education 4.0 or industry, this field or school. I think school managers should be experts on school management. So, these skills are organizing, motivating, communicating, problem solving and creative thinking…"(FM-7)*
>
> *"….The managers who are not aware of developments in the world and in their field, do not develop a vision in accordance with current developments and cannot put their in practice vision by working with their superiors in harmony seem to be useless in management position." (FM-4)*
>
> *"School managers should be individuals who support teachers and their project-based assessments, make process assessments, provide physical equipment and technological tools and use technology very well. School managers' perspective about human relations can be understood from decision processes in the school. School managers should adopt a participatory decision-making mechanism which involves teachers, students, managers, parents and the environment." (FM-10)*

DISCUSSIONS AND CONCLUSION

The literature has a consensus on the fact that Education 4.0 is the reflection of Industry 4.0 on education. It is called as educational reform which should meet the demands of Industry 4.0, especially workforce demand of it (Anggraeni, 2018, p.12-13; Hariharasudan & Kot, 2018, p.1-2; Hussin, 2018, p.92). However, because Education 4.0 is something which does not exist actually for now, it is difficult to define and so to study it. The same problem is true for Industry 4.0. There are lots of conceptual studies in the literature but empirical studies are really rare (Wallner & Wagner, 2016, p.157). This makes almost impossible to put Education 4.0 in practice before it was operationally defined and empirically researched. So, in this study it was aimed to determine the basic skills and qualifications of human components of Education 4.0 as student, teacher and school principal. The human side of Education 4.0 is so important that they are responsible for raising and being the workforce of Industry 4.0. To reach main aim of this study, members of Faculty of Education and Faculty of Open Education were interviewed. Firstly, the main qualifications of Education 4.0 according to participants were investigated. So, the main qualifications were determined as integration of digital technologies with education, seamless learning environments, individualized education, explorative education and life-long learning. The literature emphasizes usage of digital technologies in educational setting as the core qualification of Education 4.0 (Benesova & Tupa, 2017, p.2196; Hariharasudan & Kot, 2018,

p.2; Wallner & Wagner, 2016, p.156). These studies claim that the other qualifications of Education 4.0 lie in this core one (Hariharasudan and Kot, 2018, p.6). Integration of digital technologies with education is also accepted as one of the main prerequisites of innovation-based education, known as the education paradigm of 21st century (Gulicheva et al., 2017, p. 131). This technology-based learning environments are described as "globalized, automatized, virtualized, networked and flexible" (Wallner & Wagner, 2016, p.155). This is also valid for seamless learning environments which are especially emphasized from the aspect of learning anywhere and anytime (Anggreani, 2018, p.16; Wallner & Wagner, 2016, p.157). Apart from technology integration and seamless learning environments, the other studies related to Education 4.0 describe its' main qualifications as similar to the findings of this study. For example, Fisk (2017) summarizes these qualifications under nine categories. These are diverse time and place, personalized learning, free choice, project-based education, field experience, data interpretation, different assessment types to test application of knowledge, students' involvement in curriculum development and lastly teachers as mentors (Hussin, 2018, p.92-93). Sadiyoko (2017) also summarizes characteristics of Education 4.0 under nine similar categories (Anggreani, 2018, p.15). This study's findings also include similar qualifications however assessment criterion and student involvement in curriculum development process are not mentioned by the participants of this study. On the other hand, they emphasized the importance of life-long learning. There are also studies which mention about the importance of life-long learning for Education 4.0 (Hariharasudan & Kot, 2008, p.6; Wallner & Wagner, 2016, p.155). So, to actualize Education 4.0 and to create the future by describing it, learning should get rid of the boundaries of traditional school walls. Besides, education should be accessible for anybody, at anytime and anywhere.

The second sub-question of the study aims to define qualifications of students needed for Education 4.0 from the views of participants. This can be accepted as one of the biggest issues discussed in the literature related to Education 4.0 since Education 4.0 is needed to raise human resources of Industry 4.0 (Benesova & Tupa, 2017, p.2196; Wallner & Wagner, 2016, p.157). So, defining qualifications of students mean defining the human resources that Industry 4.0 needs. In this study the main qualifications of students of Education 4.0 are determined under categories of technological skills, communication and collaboration skills, learning skills such as problem solving, analytical thinking or critical thinking etc. and personal qualifications such as being responsible, adaptable, resilient, researcher etc. Technological skills are mentioned most of the studies talking about students' skills in the related literature (Hariharasudan & Kot, 2018, p.6; Hussin, 2018, p.93) because of technology-based nature of Education 4.0. However, studies generally discuss that even technological skills are pre-requisite for Education 4.0, they are already owned by students of 2010s who are called as Generation Z too. Generation Z students need collaborative and interactive learning environments, so they, themselves, also have such communication and collaboration skills (Hussin, 2018, p.93). Studies emphasize the importance of cognitive skills such as non-linear thinking and social skills such as being adaptable to intercultural learning environments, learning skills such as producing knowledge and engaging in life-long learning activities (Hariharasudan & Kot, 2018, p.6; Wallner & Wagner, 2016, p.155). Besides, Education 4.0 is related to skills such as autonomous learning, creative thinking, problem solving, critical thinking, having communication skills and being collaborative (Salmon, 2019, p.109). These skills prepare students to the real life and demands of Industry 4.0 (Hariharasudan & Kot, 2018, p.6) since these ones make them valuable and indispensable resources for the organizations of future. Such skills mentioned in the literature and by the participants of this study also look like the skills called as 21st century skills. 21st century skills include cross-cultural understanding, learning and innovation skills such as critical thinking, problem solving, creative thinking etc., digital literacy skills such as media and information literacy etc., career and life skills such as being flexible, responsible, initiative and adaptable etc. (Larson & Miller, 2011, p.122-123; Puncreobutr, 2016, p.94; Trilling & Fadel, 2009; p.xxvi) These are soft skills which go beyond just having knowledge about something. They demand cognitive processing, producing knowledge and being adaptable since the main core of Industry 4.0 era is the change.

The third sub-question of the study aims to define qualifications of teachers needed for Education 4.0. In this study the main qualifications of teachers of Education 4.0 are determined under categories of technological skills, guidance skills, lifelong learning skills and personal characteristics such as being curious, patient, open to change, adaptable and investigative. Although these qualifications are similar with the qualifications expected from the students of Education 4.0, it was determined that guidance skills are specific to teacher

of Education 4.0. Kilic (2018) emphasized that mentor teacher figure will be important instead of the classical authoritarian teacher figure in Education 4.0. The main reason why teachers' guidance skills gain importance is that the amount information which students can access is plenty. So, it is stated that the teachers of Education 4.0 should be a guide for students to access and benefit from this new information rather than being a subject matter specialist (Wallner, & Wagner, 2016, p.157). Thus, it will be possible for students to distinguish right and wrong information from unlimited information sources. It is also emphasized that teacher of education 4.0 should guide students to set their own study goals. With this guidance, students can focus on their abilities and goals in life and teachers can offer them individualized education opportunities which is highlighted in the qualifications of Education 4.0 (Wallner, & Wagner, 2016, p.156). Abersek and Flogie (2018) also point out that individualized education in Education 4.0 can be achieved through the use of technology and an innovative pedagogy approach and each student should be guided individually. Consequently, it can be inferred that one of the most important skills expected from the teacher of Education 4.0 are guidance skills. Another qualifications expected from the teacher of Education 4.0 was found as lifelong learning skills in the study. In the 21st century, teachers' lifelong learning skills have become important as teachers play a role in that not only transmitting the information, but also in teaching how to access them. Teachers' lifelong learning means that teachers are open to learning throughout their lives and know how to learn (Yaman & Kilic, 2015, p.1555). One of the main features of Education 4.0 is the implementating a learning type which emphasizes learning anywhere and anytime, such as lifelong learning, e-learning, and online learning (Kilic, 2018). In this sense, lifelong learning, important for all education stakeholders, was emphasized mostly for teachers to adapt themselves to the changing and dynamic nature of knowledge. It is also expected that teacher of Education 4.0 is competent in the use of technology and to integrate these technological skills with the educational processes. According to Cagiltay et al. (2007, p.209), the reasons that trigger the use of technology in classrooms are the students' tendency towards technology and students' demands and expectations of the use of instructional technologies in the courses. The fact that 21st century students belong to generation Z, which was born and raised in a digital age (Prensky, 2001, p.1), can be evaluated as the underlying reason for these demands. Education 4.0 is characterized as an educational approach aimed at improving digital technological competencies across all levels and enhancing the use of digital technologies for teaching and learning process. In this context, the emphasis on having digitally competent teachers to achieve Education 4.0 in the literature (Hariharasudan & Kot, 2018, p.6) supports the findings of this research. Lastly, it can be said that teachers' integration of pedagogy with technology in the teaching-learning process is one of the prerequisites of Education 4.0.

The last sub-question of the study aims to define the qualifications of school managers needed for Education 4.0. In this study the main qualifications of school managers of Education 4.0 are determined under categories of guidance skills, technological skills, learning skills and technical skills. In this study, it was emphasized that school managers of Education 4.0 should have the learning skills such as creative thinking, problem solving, critical thinking and catching up technological developments. In the literature, it is stated that the most valuable skills of Education 4.0 are creativity, critical thinking, sensitive communication and collaboration skills (Salmon, 2019, p.109). Puncreobutr (2016) states that Education 4.0 can be defined with 21st Century skills. In this context, Education 4.0 requires skills like problem solving, creative thinking, critical thinking, information and media literacy etc. Therefore, it can be said that these skills, which are important for all of the education stakeholders, are also considered as a requirement for the school managers. Another qualifications expected from the school managers of Education 4.0 are technological skills, which teachers and students should have. Because Education 4.0 is defined as a technology-based learning and teaching method (Hariharasudan & Kot, 2018, p.6), it is required all education stakeholders having technological skills in Education 4.0. For this reason, it can be said that it is an expected result that the school managers of Education 4.0 should use technology effectively and follow technological developments. However, there are different expectations under this category from school managers compared to other stakeholders. The concept of technological leadership defined as being responsible for improving the interface between the human and the information technology components (Scanga, 2004, p.5), has become one of the emphasized leadership styles of 21st century. School managers are responsible for developing leadership and management strategies for the integration of technology into schools (Weng & Tang, 2014, p.93). In short, school managers are responsible for the transfer and efficient use of computers and related technologies in the school (Turan, 2002, p.271). For this reason, it can be said that to have knowledge and

competence in digital ethics, digital citizenship and digital security issues and to lead other stakeholders of the school are expected from school managers of Education 4.0 as technological skills. Another key element of Education 4.0 is the usage of learning analytics to predict students' future performance and to maintain their continuous improvement (Ciolacu, Tehrani, Beer & Popp, 2017, p.439). In this sense, school managers' ability to interpret educational data can be evaluated as a skill that will facilitate the transition of schools to Education 4.0. Another mentioned skill for school managers of Education 4.0 is guidance skills. Puncreobutr (2016) states that the core of Education 4.0 is to guide students develop their skills to use new technologies. It can be inferred that there is a guidance and mentorship perspective on the basis of Education 4.0. So, it can be said that guidance skills are important for both teachers and school managers in Education 4.0 model. However, the guidance skills of the Education 4.0 managers differ from those of the teachers' since they refer to guidance throughout the school such as placing learning culture at school, directing school stakeholders on technology, and motivating school stakeholders. In the literature, technical knowledge and skills in task-related activity areas are called technical competences. All of the technical knowledge and competencies related to the methods, techniques and processes to be used to fulfill the task requirements constitute the technical activities of that task (Basar, 1993, p.66-67). In this study, it was determined that, unlike other stakeholders, school managers of Education 4.0 are expected to have technical knowledge and skills related to school management. It was emphasized that school managers of Education 4.0 should have skills such as organizing, coordinating, empowering school personnel, adopting a participatory decision-making mechanism in the context of technical skills. Abersek and Flogie (2017) also point out that, human skills and decentralized decisions such as making informed decisions and solving urgent problems in a short time will gain importance in the education systems adapting Education 4.0. So, it can be said that the school managers of Education 4.0 will come to the forefront with their decision-making mechanisms applied in their schools. In addition, since Education 4.0 is a technology-intensive education approach, some questions as how much the school managers of Education 4.0 invest in technology, how they give importance to improving the technological skills of the human resources in the school and how much they support innovative ideas will be important.

As a result of this study in which the basic features of Education 4.0 are examined in the context of human resources; to implement Education 4.0, the necessity of integration of technology into education is emphasized. So, importance of realizing digital transformation in education to ensure the integration of education with technology for Education 4.0 is understood. In addition, to achieve Education 4.0, it can be suggested to conduct research on the content, objectives, learning experiences and assessment elements of Education 4.0's curriculum. Also, it can be suggested to conduct studies to examine the readiness levels of Turkish Education System for Education 4.0 within the context of the qualifications revealed in this study.

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NEED FOR ACCREDITATION AGENCIES AS STAKEHOLDERS IN OPEN AND DISTANCE LEARNING: CASE OF "AUDAK" IN TURKISH HIGHER EDUCATION SYSTEM

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Received: 11/09/2019 **Accepted:** 14/05/2020

ABSTRACT

Accreditation agencies are important stakeholders for higher education institutions (HEIs) on the path to quality. They are advisors to suggest the appropriate models and tools for Quality Assurance (QA), according to the mode of delivery and institutional context. This paper gives brief history about integration of Turkey to Bologna process that has shaped the quality approach in the Turkish Higher Education System and explains how national accreditation agencies act to enhance quality in higher education. Secondly, a short literature on quality assurance in open and distance learning is provided with concentration on external evaluation by agencies. The transition to distance learning and e-learning more specifically, offers an opportunity to reorganize institutions for technology enhanced learning and enrich their means for quality assurance. Thirdly, the interpretation of European Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG 2015) for quality assurance in distance learning/e-learning and the adaptation of accreditation criteria to monitor compliance with pre-determined learning outcomes is elaborated through different models and benchmarks. As case-study, a new association founded in Turkey, AUDAK (Association for Evaluation and Accreditation of Open and Distance Education Programs) is introduced and its standards are discussed with an eye to the related literature and recent developments in Turkish higher education system.

Keywords: Quality assurance, accreditation, Bologna process, ESG 2015, quality in higher education, quality in open and distance education, quality in distance learning, quality in e-learning.

INTRODUCTION

The scientific and technological advances and economic globalization have accelerated the restructuring of higher education systems. Internationalization and the environment conducive for collaboration has paved the way also for common frameworks to compare systems and find solutions to similar problems with the involvement of stakeholders. International organizations, governmental and non-governmental have joined as actors to develop a common understanding to quality issues in higher education (HE). European Standards and Guidelines for Quality Assurance in the European Higher Education Area is a good example for these efforts. Quality assurance (QA) is among these cooperative issue areas whereby societal engagement of higher education is realized through the engagement of internal and external stakeholders. QA is an embracing term that covers all policies, processes and actions to maintain and develop the quality of a higher education institution. It involves the staff (academic, administrative and technical), students (enrolled and graduated), employers, representatives of the sectors graduates are expected to be a work

force for. The internal and external stakeholders are important to develop an internal quality system and improve it. As regards external quality assurance, accreditation agencies have become important actors to guide institutions in the implementation and sustainability of quality standards. Accreditation refers to a form of quality assessment which involves a yes/no decision and a special status granted to an institution or program (Toprak & Sakar, 2018). In the case of open and distance education, the role of accreditation agencies becomes even more critical since the interpretation, adaptation and adoption of standards designed for conventional education into distance learning is an area where there is need for professional assistance by Open and Distance Learning (ODL) specialists. Accreditation agencies are important stakeholders on the path to quality and are advisors to suggest the appropriate models and tools for QA, according to the mode of delivery and institutional context.

This paper gives brief history about integration of Turkey to Bologna process that has shaped the quality approach in the Turkish Higher Education System and explains how national accreditation agencies act as important stakeholders to enhance quality in higher education. Secondly, a short literature review on quality assurance in open and distance learning is provided with concentration on external evaluation by agencies. The transition to distance learning and e-learning more specifically, offers an opportunity to reorganize institutions for technology enhanced learning and enrich their means for quality assurance. Thirdly, the interpretation of European Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG 2015) for quality assurance in distance learning/e-learning and the adaptation of accreditation criteria to monitor compliance with pre-determined learning outcomes is elaborated through different models and benchmarks. As case-study, a new association founded in Turkey, AUDAK (Association for Evaluation and Accreditation of Open and Distance Education Programs) is introduced and its standards are discussed with an eye to the related literature and recent developments in Turkish higher education system.

EFFECTS OF EUROPEAN STANDARDS AND GUIDELINES ON QUALITY ASSURANCE IN TURKISH HIGHER EDUCATION

An example for extensive cooperation in transnational education, has been the Bologna Process, that commenced officially after the signing of the Bologna Declaration in 1999. The Bologna Declaration sets the main goals of the process, which is built upon the idea of creating a comparable, competitive and transparent European Higher Education Area in Europe. Among the major goals of the Bologna Process, one is to set up and extend a network of quality assurance in higher education, and to contribute to the improvement of higher education in Europe.

The guidelines and standards set by European Association for Quality Assurance in Higher Education (ENQA) firstly in 2005 as "ESG: European Standards and Guidelines for Quality Assurance in the European Higher Education Area", play a guiding role in quality assurance systems in higher education. The ESG framework requires higher education institutions (HEIs) in the European Higher Education Area (EHEA) to offer consistent and comparable services (http-1). In this respect, the following guidelines are adopted in setting up internal and external quality assurance systems:

- to raise students' and academic staff's awareness of quality assurance in higher education,
- to improve the quality of programs and to ensure sustainability of quality assurance in higher education institutions,
- to refer to the expertise of foreign specialists in quality assurance, and to conform to principles of transparency,
- to determine external quality assurance needs, and to give responsibilities to institutions that assume a role in external quality assurance.

Accordingly, each member country was asked to specify quality assurance standards in consideration of its education system, and evaluate the education system in the light of these standards. The member countries also establish the mechanisms to register quality assurance agencies for the review of quality improvement activities in higher education institutions. In this way, external reviewers assist higher education institutions in determining their level of quality (http-2).

Turkey participated in the Bologna Process in 2001 as a result of the need for restructuring the higher education system and alignment with the European Union legislation. In Turkey, the Council of Higher Education (CoHE) is the main institution responsible for the implementation and monitoring of the Bologna Process requirements. CoHE has seen this process as an effective instrument for the restructuring of the higher education system. To this end, the following steps were taken in a chronological order:

- The Higher Education Council issued the "Regulation on Academic Assessment and Quality Improvement" in 2005. This regulation specifies the principles regarding the review of education and research activities in higher education institutions, quality improvement, approval and recognition of the level of quality by an independent external quality review.
- The Commission of Academic Assessment and Quality Improvement drafted the "Guidelines for Academic Assessment and Quality Improvement in Higher Education Institutions". These guidelines define processes and performance indicators required for the systematic functioning of academic assessment and quality improvement practices. The processes defined in guidelines are "strategic planning, institutional review, periodicity in quality improvement and monitoring in higher education institutions".
- In accordance with the Regulation on Academic Assessment and Quality Improvement, higher education institutions have set up Boards of Academic Assessment and Quality Improvement to manage quality assurance at the institutional level. The main duties of these boards are: (1) to review academic and administrative services in the institution according to the institution's strategic plan and goals, (2) to exert efforts to improve quality and have the level of quality approved, and to perform "internal review" in the institution, and to draw up an internal review report or have it drawn up, (3) if the institution undergoes an "external review", to make preparations for the external review, and to provide support to institutions, agencies or boards that perform the external review (http-3).

Many Turkish universities applied for Diploma Supplement (DS) label to enhance national and international recognition, and to ensure that Bologna requirements are satisfied in the higher education system. Furthermore, Turkish higher education institutions have also applied for the European Credit Transfer System (ECTS) label by preparing program and learning outcomes for all programs in the institution. CoHE has recently taken new steps at the national level regarding quality assurance in the Turkish higher education system, and established the Higher Education Quality Council of Turkey (THEQC) in accordance with the "Higher Education Quality Assurance Regulation" published in the Official Gazette in 2015. The working principles of the Higher Education Quality Council are based on:

- internal and external quality assurance of education and research activities as well as administrative procedures in higher education institutions,
- accreditation processes, and authorization of independent external review agencies,
- duties, authorities and responsibilities related to quality assurance (http-4).

In this connection, external evaluation and accreditation agencies that operate in the field of higher education in Turkey must receive a certificate of authorization from the Higher Education Quality Council in accordance with the "Directive on the Authorization of External Evaluation and Accreditation Agencies Operating in the Field of Higher Education". The accreditation agencies that receive a certificate from the Council are officially authorized to carry out accreditation procedures at the national level. The THEQC is a public legal entity with administrative and financial autonomy and special budget founded for fulfilling the primary duties of (1) performing external evaluation of higher education institutions, (2) coordinating the authorization and recognition processes of accreditation agencies, and (3) ensuring the internalization and dissemination of quality assurance culture in higher education institutions. As of May 2020, there are sixteen (16) evaluation and accreditation agencies, namely MUDEK, TEPDAD, FEDEK, VEDEK, EPDAD, HEPDAK, ILAD-ILEDAK, SABAK, TUADER-TURAK, ECZAKDER, TPD, IAA, SPORAK, DEPAD, AUDAK and PEMDER that accredit four-year bachelor degree programs in engineering, medical sciences, humanities, veterinary medicine, education, nursing, communication sciences, health sciences, tourism, pharmacy, psychology, theology, sports education, dentistry, open and distance education and landscape architecture programs (http-5). The THEQC is a full member of ENQA which is an umbrella organization that represents QA organizations of countries in the EHEA (http-6). Due to the Covid-19

pandemic the transition to distance education in all national higher education institutions in Turkey, has made QA in distance learning a priority for the THEQC and the Council has declared the requirements for quality distance education as a working paper prepared by the Distance Education Working Group (http-7).

CHALLENGE IN ACCREDITATION OF OPEN AND DISTANCE EDUCATION PROGRAMS

Quality assurance necessitates the recognition of common standards however these standards and evaluation criteria are expected to manage the diversity and plurality of higher education in different disciplines and teaching methods. Distance education methods that provide flexibility and learner autonomy have always been questioned and discussed on the basis of quality when compared with the conventional/traditional face-to-face education. As the generally accepted quality framework is based on learning outcomes; many national and regional authorities use similar means to evaluate institutions and programs, both traditional and distance. However, the different means and media used in distance education need to be considered in reaching the specified outcomes. Another characteristic is the high number of students in mass education provided via distance education especially in Asian countries. These numbers may necessitate to find creative/innovative solutions and means to evaluate the institutional performances besides program learning outcomes (Belawati & Zuhairi, 2007).

Concerning the challenges of QA implementation in open universities, scholars from Commonwealth of Learning (COL) have stated their concern that OUs appeal more to "underserved" populations but are expected to meet the same quality criteria as traditional universities though the concept of quality changes. An important indicator of quality has become the suitability of graduates for the labour market; however, authors drive our attention to factors like the geographic distance from the learner, openness (which means less rigid admission requirements), plurality of actors in both development and delivery, additional administrative tasks in the ODL systems, greater use of the ICT, distinct academic workload models: roles and responsibilities, recruitment of temporary/part-time staff which need to be considered while applying conventional QA frameworks to OUs. A neo-institutional approach is recommended to understand "change" in HEIs that concentrates on "structures, norms, rules and cultures" and their effects on the perception of change (Kanwar et al., 2019, pp.80-81). Another interesting point is that authors openly discuss that QA measures may be for compliance or improvement or both. Instiutions may have limited control over the external factors, but they can determine their reaction based on internal factors, such as regulations, norms and quality culture unique to the institution, through developing the appropriate QA policies, making plans and rewarding the continued involvement of staff in QA processes (Kanwar et al., 2019, p.93).

It is argued that distance learning challenges the core academic values of higher education (HE) such as "institutional autonomy, collegiality and shared governance, the intellectual and academic authority of the faculty, formal general education and degrees, site-based education and a community of learning" (Eaton, 2000). The threats versus these listed core values are discussed to emanate for example from internationalization and consortial arrangements (transnational education), dispersion of the faculty and the students, standardized courses and pervasiveness of non-degree training. The bias against distance learning grows in case these values are identified with the quality of the institutions. Contrarily, distance education enriches HE, the regional distance learning guidelines in the US e.g. highlight the similarities between site-based and electronically-based education. However, they also reflect differences in their approaches to teaching and learning, and the challenge to core values requires a rethinking on them. A strategy to meet this challenge and adapt to the unstoppable change is to see the contribution of ODL to HE values in fulfilling their purposes in an enriched manner through ODL. After such mentality change, the standards to address outcomes and competencies can follow so that more attention can be paid to what students learn (Eaton, 2000, pp.1-3). Harvey and Williams (2010) in their review of the fifteen years of "Quality in Higher Education" journal, emphasize that there's indifference among academia towards the consumerist approach pushed mainly by governments and senior managements. The critiques of QA processes due to bureaucracy and administrative burden can be replaced by more enthusiasm towards quality work, only through incentives, motivation for innovation, creativity and trust building among stakeholders. A major reason for indifference towards QA is the commitment to autonomy and academic freedom in HE which are very important. There is need for a better alignment of the external evaluation processes to daily academic

activities and their internalization by staff both in research and teaching. The authors in the review they make, have generally provided more optimistic expectations for the internal evaluation processes, maybe also because QA is accepted in the ESG as a major responsibility of the HEIs which is a more independent area institutions can act.

The European Response to the Challenge

QA in HE covers all procedures and mechanisms in order to ensure quality at "micro, meso and macro levels" by sustaining the quality of programs, institutions and also national education systems (Vlachopoulos, 2016, p.187). The shared understanding for quality assurance as recognized by ESG 2015, has the common purpose of ensuring a high quality and relevant education based on learning outcomes and recognized by stakeholders involving the governments and employers. The need for a common language and guidelines among QA agencies towards developing a quality culture for e-learning was emphasized during an ENQA workshop in 2010 by the President of the organization. The QA agencies were recommended to use and interpret ESG as the backbone document however they were called to create additional materials to support them in monitoring both the progress and development of e-learning (ENQA Workshop Report, Grifoll et al., 2010, p.6).

A study printed by European University Association (EUA) in 2014 (Mapping Survey Oct-Dec 2013) reports that 91 percent of HEIs have already integrated e-learning into their teaching; in different modes of blended learning or online learning. It is reported that contrary to expectations, technical or open universities are not always leading institutions in ICT-supported teaching or digitalisation. There aren't many clear e-learning patterns and national policies, and strategies for e-learning are about to be developed. It is emphasized that even in the same country e-learning is implemented in different ways by different institutions. Some reasons cited are "institution profile and mission, availability of resources and funding, type of students and subject areas, different stages of experience in e-learning, levels of technology adoption and openness of staff". The need for integrating a QA framework for e-learning at national and organizational levels is highlighted as a result of this survey conducted (Gaebel et al., 2014, pp.7-9). However, despite the trend in the EHEA, QA in e-learning has not been a popular area of interest and only 23 percent of the national QA agencies have reported about their special consideration of e-learning (ENQA Occasitional Papers 26, Huertas et al., 2018, p.1).

A comparative analysis of the ESG 2005 and ESG 2015 indicates that the four basic principles remaining the same, the recognition of diversity and the importance of supporting a quality culture have found more emphasis in the latter. The developments and trends conducive to the revision of the ESG have been the shift to student-centered learning, need for flexibility in learning, recognition of competencies gained through informal education, internationalisation of HE, digital learning and new modes of delivery. As a modification of ESG 2005, the text of 2015 refers to the learning environment and its ties with research and innovation. However, the scope of ESG in the text of ESG 2015 is again emphasized to be applicable to all HE provision offered in the EHEA, "regardless of the mode of study or place of delivery". Thus they shall apply to cross-border, transnational HE, formal and informal learning and all different modes of provision such as e-learning (EQUIP Project Paper, pp.1-2). Reflecting this mentality that ESG also laid the foundation for different modes of learning including web-based provision and its regulations, there were minor revisions to ESG 2015. These standards are also applicable to e-learning, but innovative QA methods are needed to be developed with new indicators (Huertas et al., 2018, p.21). This means that both HEIs and QA agencies shall adapt their QA systems according to the particularities of e-learning. It is to be kept in mind that the technology enhanced learning is accepted as an integral part of QA system for the EHEA.

The European perspective on the QA of distance learning is closely related with the internationalization of HE. Distance education makes an important percent of transnational education across national borders. Good partnerships are concentrated on both staff and curriculum development so that participants can enjoy the opportunity of sharing different experiences and seeing different approaches to teaching and learning. This enriches them in their individual career and institutional development (Campbell & Van der Wende, 2000, p.11). However transnational education makes QA more complex, e.g. joint degree programs. The challenge is for QA agencies in their quest to adapt their processes to new modes of delivery and redefine

quality accordingly in terms of curriculum design, security of assessment, training academic staff for both international collaboration and new media for teaching. The digitalization of HE and the blended learning environment of dual-mode universities involves new actors into QA processes, such as telecommunications companies, publishers, software and IT companies, corporate and virtual universities. The agencies then need to consider their participation as well to the processes. The paradigm of lifelong learning and the increasing competition in recruitment increase the interest for technology enhanced learning, thus new capabilities of ICTs (Campbell & Van der Wende, 2000, pp.16-17). The changing circumstances are not limited with competitiveness and interest in technology. Among the effects of globalization such as the unforeseen Covid-19 virus pandemic has resulted in a very fast transition to all forms of distance learning.

Any Consensus among Different Models?

A major consensus is on the importance of a dynamic and flexible systems approach for the progress of distance education to meet different learner needs. The one-size-fits-all course structure prevents the system of HE from responding to the changing needs of learners and necessities of a competitive environment. If HEIs are to be responsive, all stakeholders need to be aware of the pros and cons of new media and what they imply in terms of reaching learning outcomes via distance education. This dynamic systems approach is conducive to taking each institution's vision, mission and organizational structure into consideration (Saba, 2012). The literature on QA in ODL focuses on a holistic and systematic approach, as such QA is perceived as a continuous improvement through which the staff gets familiar with quality issues, and strong formal quality policies are made. In the meantime, the institutions get ready to develop a sustainable quality philosophy which under strong leadership can motivate both staff and students for improvement (Vlachopoulos, 2016, pp.189-190). Reviewing different methodologies for quality assurance in e-learning, it can be seen that the focus on content, pedagogy and learning results has shifted to a systemic evaluation of processes; educational experience and learning. Despite the apparent need for a holistic approach to consider all quality factors as "inputs, resources, processes, outputs and outcomes" even accreditation agencies may show the tendency to focus more on some specific dimensions and stakeholders, e.g. preferring more measurable inputs rather than outputs (such as the employability of graduates). These common factors of QA in HE, need to be elaborated with indicators specific to online education at micro (individual learner), meso (course) and macro (program) levels, and tailor made for each institution's context with the involvement of all stakeholders (Esfijani, 2018, pp.65-70).

Do institutions re-invent the wheel while trying to formulate their own way to quality? A matrix of different quality standards published in the US were listed as: executive commitment, technology infrastructure, student services, design and development, instruction and instructor services, program delivery, financial health, legal and regulatory requirements and program evaluation (Frydenberg, 2002, p.10). Through various benchmarking models (E-xcellence+, eLearning Benchmarking Exercise, First Dual-Mode Distance Learning Benchmarking Club), there's a high level of correspondence where similar factors are explained with differences in terminology and interpretations. Universities are in a structural and innovative transition towards technology enhanced learning which brings a paradigm change for learning and teaching. The common point of different forms of technology enhanced learning is the use of knowledge and technology to "connect" people with each other and with learning resources for the purposes of formal, nonformal and informal learning. E-learning requires a change from traditional organizational and pedagogical perspectives. For quality e-learning, different aspects of "accessibility, flexibility, interactiveness, personalization and productivity" need to be embedded in the "products, management and services" pillars of e-Learning (Ossiannilsson and Landgren, 2012, pp.49-50).

A process-oriented and dynamic life-cycle model for QA in e-learning suggests to promote a culture of continuing self-improvement through three stages: (1) planning and analysis; (2) design, prototype and production, (3) post-production and delivery. It is emphasized that a purposeful and informed design of the learning tasks and provision of scaffolding resources is the key to quality e-learning which is mainly focused on improving the student's learning experience (Abdous, 2009, p.282). Another four-phase evaluation model (PDPP evaluation model) developed by Chinese scholars for e-learning courses is composed of "planning, development, process and product evaluation" phases. Planning involves analysis of market demand,

feasibility study, target student group and needs analysis, determination of course objectives and financial evaluation. The development phase consists of instructional design, course and website design, production of content based on flexibility, interaction, support and assessment. Processes to be evaluated are technical support, web utilization, learning interaction and learning support with an eye to flexibility. In the final phase, product evaluation means measurement of student satisfaction, teaching and learning effectiveness and sustainability of the services (Zhang and Cheng, 2012, p. 66).

The evaluation of student learning is critical in the accreditation of distance learning, in order to assure that the students achieve the learning outcomes. Technology provides the necessary learning platforms with multiple tools and assessment methods (Krause et al., 2015). This is also applicable to competency-based education where a student's understanding of a topic is evaluated through demonstration of mastery in certain skills or learning outcomes related to a specific topic, and the students can master their subject skills at their own pace. This is achievable via ODL media and the suggested methods for evaluation of student performance are written papers, portfolios and projects. Institutions can develop their own assessment criteria according to their student profiles and for each case specific to the type of program and discipline. For an efficient self-paced competency based education, for example, the demonstration of competency is more critical than assessment of learning; thus, summative assessment of the demonstrations, practices can be weighed more. In this case, engagement one-to-one with a faculty member/mentor maybe more supportive than peer interaction. It is important that the necessary tools are provided to learners in order to ensure that the learning outcomes are met. So, there is need for specific criteria up to the nature of the course/program according to targeted qualifications and program outcomes (Krause et al., 2015).

The accrediting agencies generally use the existing standards for site-based courses to evaluate online learning environments. There are different modes of delivery and different approaches to QA by HEIs where agencies try to find out the most appropriate way to support them on their path to quality HE. The distinctive features of distance learning and the expectations from different role-players in different quality pillars of ODL (institutional commitment, curriculum and instruction, faculty support, student support, evaluation and assessment) need to be considered in modifying the accreditation guidelines. This is because stakeholders may have different perceptions and definitions of quality as a result of their negotiations around different power relations and interests during the planning process. In a classical systems model, where the sociopolitical aspects of curriculum planning and unequal power relations among the planners are ignored, it is difficult to evaluate if the planners have made the right decisions and whether different expectations of the stakeholders are taken into consideration or not (Benson, 2003, pp.145-147). Some quality frameworks emphasize program planning and curriculum development more than others and argue that the processes must be ethical as well, besides being technical and social. The different dimensions of quality, at different levels can be classified as (1) quality for improving the reputation of the institution, (2) quality through accreditation where the core program meets accepted set of learning outcomes, (3) quality as efficient and effective (collaborative) course development and (4) quality as effective pedagogy through student engagement with the course content (Benson, 2003, pp.150-151). The difficulty to adapt the traditional accrediting paradigm to new educational environments may lead to a paradigm change which is certifying the individual (learner/instructor) instead of accreditation of the institution. E-learning has changed the traditional indicators of quality such as contact hours and physical attendance, and turned them into indicators like interaction and qualification of the instructor (Pond, 2002, pp.3-5). The problem is that "educational delivery evolves faster than QA methods" whereby it has to be determined according to student's level of learning and his/her learning experience which means that the institution shall be evaluated in the context of students' experiences and feedback from all stakeholders (Pond, 2002, p.6).

Concerning the quality of distance education systems, it can be argued that the distant mode improves the quality of education provision, firstly because the remotely located/distant learners can easily access the learning environment (ENQA Workshop Report, Rubin, 2010, p.19). Unless there is a digital gap and the technology enhanced learning is not a further disadvantage to some learners, it is an indicator of quality indeed. E-learning efficiently can bridge the distance gap; however, the learning content must be updated regularly in order to improve professional competences, and the teaching methodology must be designed to help the learner master the learning material. Also, owing to the huge competition among the content developers in the ODL field (unlike the situation with instructors in the conventional education), there is

need for standards such as ISO 19796-1 for e-learning standardisation. Since there is no comprehensive e-learning quality evaluation system to monitor all functional aspects of distance teaching, it is critical that independent accreditation agencies monitor all processes, however, in a professional, transparent manner based on "trust" between stakeholders (ENQA Workshop Report, Rubin, 2010, pp.23-26).

HEIs in checking the suitability of different QA models, may choose generic or specific approaches. Adaptation of generic approaches like ISO 9000 or EFQM is a great deal of effort, on the other hand, approaches specific to learning may not have wide acceptance. Though many institutions are aware of the need for QA mechanisms they may not have the instruments to fulfill the requirements of different agencies and adopt their approaches. ISO 19796-1 is recommended as a reference framework and instrument for adaptation and adoption of different quality approaches for organization-specific development of quality system in e-learning. An example discussed is that the management guideline principles of Total Quality Management can be combined with content guidelines specific to e-learning, so the framework is functional as a roadmap and used as a collection/pool of criteria. With this perspective, the steps to a quality system in an educational organization are; context setting, model adaptation, model implementation/adoption and quality development, where the participation of many actors and their consensus is required for each step (Pawlowski, 2005, pp.4-7)

The agencies are important for monitoring if e-learning meets stakeholders' needs or not. Since ESG 2015 does not emphasize specific statements on e-learning, agencies must adapt to alternative teaching and learning with the understanding that e-learning is an integral part of HE and should not be evaluated separately. Among priorities in this adaptation, ENQA's report lists firstly development of teachers' e-maturity and supporting ICT skills of learners. The professional competence and appropriate educational strategies to manage distance education (DE) are important, as well, through mechanisms such as reward systems for dedicated teachers or the use of social media for collaborative learning (ENQA Workshop Report, Ossiannilsson, 2010, pp.44-45). This is a heavy burden since distance learning requires expertise in all its components and its challenges necessitate innovative approaches.

The Cultural Diversity

Innovative way of thinking about e-learning asserts that it isn't just a delivery mode besides other educational media, but is a new approach to teaching and learning. This is why followers of this idea see a necessity for "e-quality", norms of which are also embedded in cultural-pedagogical issues and contexts. Since different e-quality models emanate from benchmarks, there is need for a theoretical approach which can explain socio-cultural aspects of quality criteria from a systematic point of view. The benchmarks all come with their own philosophy and certain cultural, pedagogical norms and values which is dominantly Western pedagogy. Seeing education as a social and cultural enterprise, for a working quality framework, cultural diversity must be recognised at both micro and macro levels. This means that quality criteria need to be adaptable to different cultural and institutional contexts especially for developing countries (Masoumi and Lindstrom, 2012, pp.28-35).

The QA models need to be selected also with an eye to the translation and adaptation of the international standards that may reflect different pedagogical culture and traditions inapplicable as they are in some national systems. In a study by Gao and Legan (2010), about the adaptation of QM rubric to review courses in China, the authors emphasize that the items in the rubric had to be adapted according to local habits of mind and cultural setting. The QA agencies and stakeholders must be aware that they appeal to international thus multicultural audiences with their standards and different design suggestions. The role(s) of the teacher and learner; different learning styles, regulatory policies such as learner privacy, material/ textbook adoption, accessibility may be among issues that are worth more attention compared to others, due to different cultural settings and institutional structures (Gao and Legan, 2015, p.210). In addition to the cultural diversity that may take place at individual, societal and institutional levels; the components of the ODL system need to be taken into consideration when speaking about accreditation of distance education institutions and programs; such as learning materials, instructional design, assessment, support services for students and teaching staff alike. In this connection, institutions need human resources specialized in ODL when establishing their own systems for QA and accreditation (Kocdar, 2011). The review teams must be

composed of these specialists besides field/discipline experts so that they can understand and evaluate issues, necessities, technologies, organizational structure and staff qualifications required by open and distance education. "*A true e-learning expert is someone who is really aware of the novel opportunity of having access to the record of learning interaction and engagement*", thus this is also a quality culture where e.g. the composition of the panels gets very important (ENQA Workshop Report, Mulder, 2010, p.31).

In a study by Manatos and Huisman conducted to see how national accreditation agencies interpret ESG and adjust them to their domestic context, it was seen that national QA frameworks often deviate from the ESG. In fact ESG provides a source of assistance for both HEIs and agencies of external QA and functions as a common frame of reference. So it is a generic guidance as the authors emphasize. National agencies translate ESG in a metaphorical sense to their own context and edit them. The researchers give reference to the Scandinavian institutional theory and explain that policies and practices during their travel to another country or from one policy area to another, are subject to interpretation, editing, adaptation and translation. This interpretation and its magnitude is up to the feature of the idea, its specific content and the relationship between the recipient and source. It is seen that both ESG and the national frameworks are used in the reports of accreditation agencies. However, there is also no radical alteration of the standards since this could put the legitimacy of the agency at stake as a member of ENQA or the European QA Register for HE (EQAR) the organization where agencies are registered at European level. It is explained that technical elements are copied more, and less tangible issues like the quality culture change in reports, another result is that the public HEIs apply ESG more than private institutions (Manatos and Huisman, 2020, pp.49-50). The Bologna regime of HE sees accreditation as a way to sustain the quality of programs, credits and degrees. However, a European Accreditation Agency is not welcome, because the recognition of credits and degrees is defined within the autonomy of the HEIs (Campbell & Van der Wende, 2000, p.23). This is why, guaranteeing the minimum quality through national QA systems and guides may be more preferred as in the case of Turkey.

AUDAK: PIONEER ACCREDITATION AGENCY IN TURKEY FOR ODL PROGRAMS

AUDAK was founded on 31st July, 2017 as an association to function as an external QA agency to inform public and private institutions about management and organization of ODL, evaluate and accredit ODL degree and non-degree programs. As previously stated, AUDAK had to be approved and registered by The Higher Education Quality Council of Turkey (THEQC) in order to be able to accredit open and distance education undergraduate programs in Turkey. Within the Turkish higher education system, THEQC is responsible for;

- internal and external quality assurance,
- evaluation of education, research and social contribution activities and administrative services of higher education institutions based on the national and international quality standards,
- authorization, recognition and monitoring of independent external evaluation and accreditation bodies (http-8).

With the vision of THEQC to be an effective and internationally recognized organization in the field of quality assurance in higher education, its application for full membership to The European Association for Quality Assurance in Higher Education (ENQA) was accepted by ENQA for a 5-year term as of 28 April 2020 (http-9).

The evaluation criteria of THEQC are based on internationally accepted practices such as ESG in particular. Accordingly, the criteria for the authorization of the National External Evaluation and Accreditation Bodies are grouped under seven (7) main headings, which are listed below (http-10):

1. The organization applying for registration must have pre-defined and declared mission and objectives. Thus, it should continue its activities in line with these objectives and broad stakeholder participation should be ensured in its governance processes and practices. In addition, applications and criteria for output-oriented program accreditation must be proven to be reliable and compliant with the national and international standards (especially ESG part III).

2. The institutional and financial structure of the organization applying for registration must be sound and sustainable, in accordance with the legislation and the field of activity.
3. The organization applying for registration should act independently in terms of its organizational structure, operational processes and responsibility for official results.
4. The organization applying for registration must regularly publish general evaluation reports (Thematic Analysis Report) that analyze the results of program accreditation activities.
5. The organization applying for registration must have adequate and appropriate resources both in terms of human resources and physical infrastructure to be able to carry out the program accreditation activities.
6. The organization applying for registration must have the necessary internal quality assurance processes in place to monitor, evaluate, and secure the output of its activities and to perform continuous improvement activities.
7. The applicant institution must be involved in external evaluation processes to assess the compliance of its activities with national and international standards (especially ESG part III) and to continuously improve the quality assurance system.

AUDAK made its formal application to The Higher Education Quality Council on 12.March.2020 to obtain a Certificate of Quality Assessment Registration. On April 10, 2020, it obtained the National Registration Certificate, valid for two years as an accreditation agency (http-11)

The steps taken by AUDAK for the registration process are summarized below:

1. Pre-registration: THEQC pre-registration e-form was filled for AUDAK.
2. Application file: The AUDAK Self-Assessment Report was prepared with evidence that the seven (7) criteria mentioned above had been met.
3. Application: AUDAK electronic application was made via the System of Accreditation Organizations (AKSIS).
4. Preliminary assessment: AUDAK's self-assessment was evaluated by the THEQC experts.
5. Application evaluation report: The report prepared within 30 days by the assigned commission was submitted to the THEQC.
6. Decision: THEQC granted AUDAK 2 years of authorization.
7. Appeal: AUDAK has the right to appeal to the THEQC within 30 days (http-12)

As the result of the above summarized legal procedure, AUDAK is an agency authorized by the THEQC to accredit distance bachelor degree programs in business administration field. What is unique about AUDAK among other national agencies is its specialization on ODL and its evaluation criteria that focus on means to meet the learning outcomes as stated in the Turkish Qualifications Framework for Higher Education. Besides, its main characteristic is its inter-disciplinary nature separating it from the other fifteen national accreditation agencies authorized by the THEQC, since AUDAK aims to appeal to different disciplines provided via open and distance education. This first application to the THEQC has been made for Business Administration since there is no national QA agency accrediting business schools in Turkey. CoHE has decided for the ESG as the roadmap to quality in HE including internal and external QA processes. In this connection, the association aims to guide ODL providers to meet European and other internationally recognized standards, and assure sustainability of their quality systems. THEQC seeks whether the national agencies consider standards of international agencies in the related discipline(s) or not.

For example concerning management education worldwide, many business schools seek accreditation by EFMD (European Foundation for Management Development) EQUIS (European Quality Improvement System), AACSB (Association to Advance Collegiate Schools of Business) or AMBA (Association of MBAs). Among them European EQUIS with CEL (Certification of e-Learning) based on benchmarking and AACSB International have covered QA in online education. According to AACSB Distance Education Task Force Report (1999) about quality issues in distance learning, among business schools accredited by AACSB International, those institutions that offered distance programs (53 percent of respondents) did so because they preferred to build their system and pedagogy on flexibility, collaboration, hybrid/blended

approach, team building; and competency in technology support and targeted to have students from different geographies both within and outside the US. Schools that did not offer distance programs (47 percent of respondents) expressed the idea that degree via DE would weaken the quality and brand of their business school (Popovich and Neel, 2005, p.238).

EFMD has declared its intention to fill the void for a comprehensive e-learning quality system in operation. An important criterion is the suitability of the faculty for teaching online, some members of the faculty may not be ready even after a training. This is why some virtual universities have preferred to recruit adjunct faculty. The case of U21Global consortium and its four-step policy of recruitment may be given as an example of this understanding: recruitment; training and accreditation; supervision and mentoring; reflection and performance appraisal (Sixl-Daniell et.al, 2006, pp.2-3). AUDAK aims to be an actor in the evaluation of international programs as well, where there is an increasing need due to internationalization of curricula and student profiles. As regards transnational education, some international projects and consortiums are shown as failures in online education, and this critique may be due to their international context which makes QA processes in distance learning even more complex to implement. However, e-learning may be done well in some departments and poorly in others, even within the same university. The lenses that do not see e-learning as evolved from conventional teaching and learning, but approaching it as a "discrete" mode of delivery and examining the "factors specific to it" can be a more promising solution for quality education (Oliver, 2005, pp.173-175). This is why it has been the motto of AUDAK in determining its criteria for quality distance education. Besides, despite the competition and turbulence in the international arena, "national quality systems" may be more comprehensive and appealing that can clearly and consistently guide institutions on their path to continuous improvement. THEQC after Covid-19 pandemic has announced a framework for distance education and quality assurance system and listed the main elements of quality distance learning as: distance education policy, infrastructure and accessibility, competencies, learning and teaching processes, professional human resources and support services, information security and ethical aspects (http-13).

AUDAK's Evaluation Criteria

AUDAK evaluation criteria for Open and Distance Education Undergraduate Programs aim to ensure the quality assurance for open and distance education undergraduate programs consisting of at least 8 semesters or equivalent (240 ECTS credits), and support the continuous improvement of these programs. The institution applying for the evaluation of an open and distance education program at the undergraduate level is obliged to prove that the program in question meets the criteria. The general criteria are grouped under 10 headings, which are stated below:

Criterion 1. Students: These are the criteria regarding all student services offered during the period from enrollment to graduation.

Criterion 2. Program educational objectives: These are the criteria indicating the qualifications needed by the program to meet its instructional objectives.

Criterion 3. Program outcomes: These are the criteria that help program outcomes align with the program educational objectives. AUDAK degree programs are determined based on the program outcomes evaluation criteria stated by the Turkish Higher Education Qualifications Framework and the undergraduate education qualifications in the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG, 2015).

Criterion 4. Continuous improvement: These are the improvement and development-based criteria to ensure the sustainability of the program.

Criterion 5. Curriculum: These are the criteria for each program that require a curriculum that supports program objectives and outcomes.

Criterion 6. Faculty qualifications: These are the criteria to ensure the adequate number and quality of the teaching staff and ODL experts to meet the needs of the program in the field of open and distance learning.

Criterion 7. Infrastructure/facilities, equipment, procurement and archiving: These are the criteria for the competencies related to infrastructure/facilities, equipment, procurement, and archiving to provide the instructional services of the institution and ensure interaction between its stakeholders.

Criterion 8. Institutional support and financial resources: These are the criteria regarding the financial power of the institution to ensure the quality and sustainability of open and distance education programs.

Criterion 9. Administrative structure: These are the criteria related to management activity that demonstrates the sustainability and competitive superiority of the organization.

Criterion 10. Program-specific criteria: These are the criteria related to the instructional plan determined according to the qualifications defined in the specific field of each program (http-14).

The European counterparts; national agencies in Norway (NOKUT), Sweden (NAHE) and the UK (QAA) have guidelines for quality assessment of distance learning. Such guidelines are as expected, based on the differences between a distance teaching university and a conventional one. The context/environment of the university and its characteristics; the inputs such as the student profile, teaching staff (resident and collaborating), technology infrastructure; teaching process homogeneity and products including academic, personal and professional outcomes are to be evaluated. The assessment process can be divided as institutional and degree (program) levels; however, the dimensions of both levels must be elaborated with specific indicators, standards and evidences for each dimension. The institutional level covers aspects common to all distance programs of the institution such as the mission, vision, delivery system, infrastructure, QA policy and internal QA mechanisms and information systems. Evaluation at the program level specifies how the mentioned aspects, policies and mechanisms work for each study program with reference to its instructional design, learning assessment and learning outcomes (ENQA Workshop Report, Huertas et.al, 2010, pp.12-16). The most critical point is that the references must be based on indicators, standards and their evidences specified for distance learning and online education. This has been the understanding when determining the indicators for general and program specific criteria by AUDAK.

As in the case of accreditation of conventional programs, during accreditation processes of distance teaching institutions, self-evaluation reports are prepared and an external panel reviews the subject report prior to their site visit which is recommended to be supported by online interviews so that all stakeholders can be heard during the assessment. When it comes to distance education, it is important that the external review panel is well-informed about the specific nature of the institution and most preferably are trained in an e-learning system. Besides the evaluation of the virtual campus/VLE (Virtual Learning Environment), the online interviews with the students are critical as well. The strategic plan, the budgetary information of the institution constitute other important pillars of evaluation in coming up with a decision about the subject institution(s) (ENQA Workshop Report, Huertas et.al, 2010, p.16). In the case of distance teaching institutions generic evaluation is the backbone for specific evaluation of the program(s). Since there is a limited number of case-studies available in the literature and limited number of reports by the QA agencies for the evaluation of distance teaching HEIs, evaluators need to be more alert about the implementation and differences of distance learning.

ENQA's Occasional Paper published in 2018 has recommended QA agencies that they make a proper and appropriate interpretation of the ESG for all modes of teaching and learning including e-learning. Teaching and learning process, learning resources, the VLE, student support system and the pedagogical innovations it may require according to the institution's circumstances are emphasized in the paper by subject experts. Among the indicators, the involvement of all stakeholders in developing the e-learning criteria (for institutional or program evaluation) and the availability of the criteria to public are especially highlighted. The agencies are required to have very effective public relations and transparency so that they can build trust among all stakeholders which is very important so that they can be accepted as partners and guides on the continuous path to quality. For the implementation of the evaluation by an agency, its is reminded that with the self-assessment report, all necessary data to access the learning environment (system/VLE, classrooms, debate forums, materials) should be provided to the panel prior to the site visit. The institution's pedagogical model (instructional design), innovation and technical infrastructure, experience and knowledge of staff, services and support for both students and faculty should be examined. The diversity of staff for e-learning (authors, lecturers, tutors, mentors, study directors, coordinators, technical staff etc) must be considered during the planning of interviews with different stakeholders. The peer-review experts/panel (including student reviewers) must have experience with online teaching and/or learning, and they must be trained about e-learning (Huertas et al., 2018, pp.17-19). The guiding role of the agencies is very

clear in their expected civic engagement, independent and autonomous structure composed of field experts and having inter-disciplinary character so that they can disseminate the know-how in distance education.

Integration of e-learning in the ENQA guidelines for QA has been suggested through an international network of organizations such as EADTU, EDEN, EFQUEL, ICDE, and benefits of participating to benchmarking exercises has been recommended. Among these benefits; participation of the staff to internal processes of the institution, transparency of the educational processes and reflection on issues such as policies, documents and web pages can be given (ENQA Workshop Report, Ossiannilsson, 2010, p.35). A self-assessment of the institution and increasing awareness on strengths and weaknesses of the institution are the minimum outcomes and benefits of the QA processes. The intersection set of different European models such as EADTU's E-xcellence+, ELQ-model of Swedish National Agency (NAHE) is the priority of a holistic approach when integrating e-learning criteria to QA processes of HEIs. NAHE has set its criteria as "material/content, structure and virtual environment, communication, cooperation and interaction, student assessment/flexibility and adaptability, support (student and staff), staff qualifications and experience, vision and institutional leadership, resource allocation, holistic and process aspect". These methods can be adapted for different delivery modes of e-learning besides mobile, distributed, blended or integrated learning (ENQA Workshop Report, Ossiannilsson, 2010, pp.41-42) EADTU's E-xcellence Quality Associates is based on benchmarking at strategic management, curriculum design, course design, course delivery, staff support and student support for seeking improvement with four core values of HE: accessibility, flexibility, interactiveness and personalisation (http-15). Their fulfillment is among objectives of AUDAK criteria, that can be grouped as "students, program/curriculum, management and faculty" whatever the distant mode of delivery is and the media used are for technology enhanced learning.

Among the mostly cited success factors for distance education; university leadership, infrastructure and faculty support systems can be given. The administrative policies and investments, technology facilities and applications, human resources management for continuous career development, training and incentives are among components of strategic management and infrastructure. As regards support systems, methods for the engagement of both faculty and students are important. The willingness and readiness of faculty to use new technologies and distance education techniques with appropriate pedagogy are among basic criteria for distance education systems (Angolia and Pagliari, 2016). All these pillars necessitate certain technical and pedagogical standards to be fulfilled so that the learning objectives can be met. On the student side, motivation and provision of skills, like time management and digital literacy are indicators for the quality of student experience in e-learning. It is the responsibility of the HEIs to define and update the required technology infrastructure for their students' individual participation. It is up to QA agencies to monitor the implementation/practice and show HEIs their shortcomings, areas for improvement and innovative ways of doing so. One of the key indicators of improvement is the adaptability of DE courses to different learning styles. The successful management of these processes also lies with the university's leadership, culture, administrative and financial resources so that the institution can "keep pace with the learners" and developments in ICT (Angolia and Pagliari, 2016). QA in distance learning is a huge task since all indicators are indispensable, integral parts of the system and what is more, the cases all need to be evaluated from a holistic but unique way for each institution/program. This has been the mentality in developing AUDAK's criteria and their indicators for evaluation of distance program(s).

AUDAK Criteria for QA in Open and Distance Education

A summary of AUDAK's criteria for quality open and distance education bachelor degree programs are as follows (http-16):

Students

- Students must have achieved the program outcomes.
- Admission requirements must be monitored and evaluated on a year-by-year basis.
- Admission of students by horizontal and vertical transfer must be carried out according to the relevant legislation.
- Opportunities to encourage student mobility must be provided.

- The necessary orientation must be provided for students to become "open and distant learners."
- Consultancy/e-consultancy services must be provided to support students.
- Academic counseling/e-academic counseling must be offered to guide students on career planning.
- Students must be offered e-support services.
- Students must be offered e-guides.
- Students must be offered online social networking opportunities.
- Learning and evaluation methods must be provided via electronic media.
- Students' achievements in all courses and other activities must be evaluated through consistent evaluation methods.
- Student Information System must be used in the institution.
- Relevant policies must be in place for the evaluation of student complaints.

Program educational objectives

- For each open and distance education program to be evaluated, the program instructional objectives must be defined and published on the website of the institution.
- These objectives must
  - be in line with the AUDAK's definition for program educational objectives,
  - comply with the mission of the institution and the unit,
  - be determined and updated as needed by including internal and external stakeholders in the process, and
  - an institutional alumni e-tracking system must be launched and used.

Program outcomes

- Program outcomes must be defined to be compatible with AUDAK program outcomes.
- Evidence that program outcomes have been achieved must be provided periodically.
- Students who have reached the graduation stage in open and distance education programs must be proven to have achieved the program outcomes.

Continuous improvement

- The results obtained from the assessment and evaluation systems must drive the improvement of the relevant program.
- To ensure the sustainability of the program, the necessary quality strategies for improvement must be implemented.
- Work processes in the relevant unit must be analyzed and work flow diagrams must be created.

Curriculum

- Each program should have a curriculum that supports program instructional objectives and outcomes.
- Teaching methods to be used in the implementation of curriculum should be provided to students through open and distance education.
- There must be an integrated institutional Management Information System to secure the curriculum and ensure its continued development.
- The curriculum must include basic sciences education relevant to the related discipline, vocational education and elective courses.
- The curriculum, learning environment and materials must be designed and presented in accordance with open and distance learning principles.
- Instructional media and materials must enable students to reach program outcomes.
- Open and distance learning systems must provide instructional models and online tool options appropriate to the needs of students and educators.
- Open and distance learning environments must be designed to allow access and cooperation to internal and external stakeholders through the social networks of the institution.

- Teaching staff (faculty) and technical staff must be involved in the development of curriculum content, learning environment and materials.
- Open and distance learning environment and materials must have adequate level of interaction (student-content, student-student, student-teacher interactions).
- Open and distance learning environments and materials should provide feedback to students through self-assessment activities (exercise questions, trial exams, etc).

Faculty qualifications

- Faculty/teaching staff must be at an adequate academic level and have the number and quality to meet the needs of the program in the field of open and distance learning.
- Teaching staff must ensure that the program is maintained, evaluated and improved effectively.

Infrastructure/ facilities, equipment, procurement and archiving

- The institution must use open and distance learning technologies in provision of education and ensure interaction between its stakeholders.
- The institution offering open and distance education programs must have a Learning Management System (LMS) and Unit Management Information System and this system must be integrated with the Management Information System (MIS) of the parent institution.
- The unit(s) delivering the open and distance learning processes must have physical spaces (offices, offices, centers, studios, exam centers, etc.) and these spaces must be adequately equipped to achieve the educational objectives and program outcomes.
- The technical specifications for the physical spaces and the equipment that these spaces have must be based on stakeholder needs.
- Students must be allowed to do extracurricular activities to meet their social and cultural needs.
- The necessary infrastructure must be provided for the programs that have practice-based courses.
- The technical infrastructure must be adequate for the scientific research of students and faculty members.
- All systems utilized to communicate and provide information in open and distance learning programs must be reliable and have urgent action plans.
- All personal and academic information and documents related to students must be archived, stored and protected in a confidential and secure electronic environment.
- System maintenance and monitoring and performance evaluation must be carried out in accordance with the set standards and must be updated when necessary.
- Students must be provided with an institutional virtual library to reach information and improve their study skills.
- The necessary safety precautions must be taken in the offline and online learning environments that students use.
- All kinds of physical and online infrastructure arrangements must be made for the disabled.

Institutional support and financial resources

- The main institution's administrative support, constructive leadership, financial resources and strategies for their distribution must ensure the quality and sustainability of open and distance education programs.
- The financial resources of the institution should be sufficient to employ a qualified teaching, administrative and technical staff and to sustain its professional development.
- The institution must have the necessary financial resources for the infrastructure and improvement of each program.

Administrative structure

- The institution/organization providing open and distance education services must have an *Organization Manual*.
- The work processes should be organized to support the achievement of program outcomes and educational objectives.
- The unit must have a quality assurance policy. The *Quality Manual*, in which the sub-policies reflecting this policy are defined, should be shared electronically with the internal and external stakeholders.
- The unit should have the methods to plan, implement, control and take measures in-unit mechanisms for the operation of the open and distance education system.
- While providing resources for open and distance education, the unit must take into account the hardware, software, human resources, teaching/research needs, and technological developments.
- The mission statement of the unit must state that it intends to provide qualified open and distance learning service, which must be published on the unit web page for all stakeholders.
- The unit vision must state how it envisions itself in the future in the field of open and distance learning, which must be published on the unit web page for all stakeholders.
- The unit must prepare a strategic plan in accordance with its mission and vision, and this plan must be published on its website.
- The unit must certify that it complies with ethical principles in promotional materials and activities for prospective students.
- The unit must comply with legal regulations and ethical principles for student admission.
- The unit must publish clear, accurate, objective, up-to-date, and easily accessible information about its programs and activities in print and electronic form.
- The unit must announce that it implements fair and transparent processes in recruiting qualified staff.
- The unit must perform its staff training based on continuing education principles.
- The service outsourced from outside the institution/organization must be secured by contracts.
- Research and innovations in the field of open and distance learning must be considered high-level activities and supported with career development incentives.
- The newly-hired personnel who are to work in open and distance learning must be provided the necessary orientation.

Program-specific criteria

Program-specific criteria refer to the additional criteria for the curriculum determined by taking into account the qualifications defined in the field of business administration.

AUDAK as an accreditation agency is a pioneer organization firstly because it is the first national accreditation agency focused on open and distance education. Secondly, AUDAK aims to provide counselling and evaluation/accreditation services to a wide spectrum of institutions, such as distance education/continuous education centers of HEIs, private companies that produce learning materials for ODL, public and private institutions that provide non-degree, informal, lifelong learning courses/programs, Short Learning Programs (SLPs), certificate programs, Massive Open Online Courses (MOOCs). These areas AUDAK is interested are in addition to its role as the program evaluation authority granted by THEQC. These areas put forth further responsibilities for the quality of "lifelong learning". Since blended learning/technology enhanced learning in HE is becoming a general practice, there is need for application of quality standards for open and distance education/e-learning with the collaboration of all HEIs/universities.

CONCLUSION

Most of the universities already have policies for ICT-supported teaching or digitalization, and have integrated e-learning into their curricula through different modes. Many countries have developed their distance education strategies in line with international organizations and have their own national authorities and working groups devoted to studying the pros and cons of digitalization and are making collaboration to find ways of developing and sustaining quality in their systems, institutions and programs. The need for integrating a holistic and systematic QA framework for e-learning at micro, meso and macro levels has already been accepted and declared by the main QA organizations and agencies in the EHEA as well. Through the economic and technological effects of globalization or a pandemic which causes a global alert and trigger a very quick transition to technology enhanced learning, highlighting the importance of digital skills for everyone, open and distance education has a greater place in our lives and its QA deserves more attention that it could attract before. The development of QA in distance learning/e-learning can be enhanced by professional, transparent assistance provided to HEIs by evaluation and accreditation agencies. This can be achieved through a relation based on trust where the agencies are also monitored, registered and recognized by national and international stakeholders.

The accreditation and/or academic audits are either mandatory or voluntary in different countries and the agencies are governmental, quasi-governmental or independent institutions. Practices may change, however according to all approaches, quality agencies are important stakeholders, which governments keep an eye on, though the level of control and the means utilized to monitor their work may change (Lewis, 2016). Quality assurance agencies work with standards to evaluate students' learning outcomes. In addition to this, the penetration of ODL to all disciplines emphasizes the need for evaluation criteria developed specifically for open/distance/online/blended learning that requires the evaluation of ODL media utilized to reach the outcomes. Institutions apply either common standards for conventional and distance education or standards specific to distance education. However, behind is a common rationale for the adoption of quality frameworks; that is ensuring accountability and improving the quality of services. This sensitivity vis-a-vis social engagement and transparency required for this, also necessitates a thorough examination of the ODL QA methods and their integration to the accepted standards in both national and international contexts. AUDAK in these circumstances aims to be among best-practices in the provision of QA standards specific to open and distance education, assist distance teaching institutions on their path to quality and at the same time continue with its own improvement as an agency.

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SECOND LIFE: A THREE-DIMENIONAL VIRTUAL WORLD FOR DEVELOPING THAI EFL LEARNERS' ENGLISH COMMUNICATION SKILLS

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Received: 15/09/2019 **Accepted:** 12/06/2020

ABSTRACT

This quasi-experimental research aims to investigate if applying the Second life, a virtual platform, in the English communication classroom is highly effective. Other factors such as the gender differences, the difference of majors of study, and the number of hours spent on computers were also investigated. The Second life has been employed as a research tool in the study for developing English as a foreign language undergraduate students' English communication skills. The samples of this study were 40 undergraduate students from two different majors, social sciences and science, divided into16 males and 24 females. They were studying English course at the university as a compulsory subject. The students took the TOEIC test as the pre-test before the semester starts. They were, then, asked to practice their English communication skills by typically interacting with the English contents, having discussion in the Second Life platform virtually outside of the classroom. After the TOEIC test was taken again at the end of the semester as the post-test and the data has been analyzed by t-test and ANOVA, the findings show that students with different backgrounds which were genders, fields of study, and hours of spending the computers have indifferent mean scores in their communication skills. It means all the students have developed their English communication skills. Applying the Second Life in English Communication classroom for EFL learners is highly recommended.

Keywords: English communication skills, Second life, Thai EFL learners, Virtual classroom.

INTRODUCTION

The rapid evolution of information and communication technology has a great influence on the societies and education. Particularly, educators in the field of language teaching or English teachers always make conscious and research effort to increase the effectiveness of their teaching approach. They have wholeheartedly tried to find any productive ways to make language learners enjoyable while they are learning the subject. Various activities, namely games, songs and interesting stories, have been integrated in the language classroom for ages. Nevertheless, when the technology like computers is launched to the market along with other useful programs like the internet, technology- enhanced education is becoming an increasingly important. Virtual platform like Second Life has recently been applied in teaching and learning, especially Second Life (SL). However, only handful of studies has investigated its effectiveness in enhancing English communication skills, specifically in the Thai context. The present study aims to address this gap by exploring the use of SL into the university English communication courses in a comprehensive university in Thailand. It hopes to contribute to the growing body of knowledge in the use of virtual platforms in language teaching and learning.

OBJECTIVES OF THE STUDY

The aim of this study is mainly to investigate if applying the Second life, a virtual platform, in the English communication classroom is highly effective. Other factors such as the gender differences, the difference of majors of study, and the number of hours spent on computers were also investigated. Within this perspective, the research objectives for this study are as follows:

1. To investigate if there is significant development of EFL students' English communication skills learning through the Second Life virtual classroom.
2. To explore whether the gender differences, the different majors of study, and the number of hours spent on computers have any impacts on students' English communication skills development learning through the Second Life virtual classroom.

The two significant objectives mentioned earlier aim to answer the following two significant hypotheses:

1. The students' post-test scores will be greater than their pre-test scores at the level of significance.
2. The gender differences, the different majors of study, and the number of hours spent on computers have significant impacts on students' English communication skills development.

LITERATURE REVIEW

Second Life for Education

In 2003, the new interesting virtual world called "Second Life" has been released. This internet-based 3-dimensional virtual world has been created by Linden Labs Company in San Francisco. The total numbers of users around the world now has beaten the numbers of over 16 million registered users over the last few years (Linden Lab, 2009). Though there were other virtual reality environment such as Twinity (Metaversum GmbH, 2009), and There (Mekena Technologies, 2009) as the SL competitors, it was considered the most attractive virtual world as there were various interesting activities the users can enjoy compared to its competitors (Wagner, 2008). Avatar is called for the users' virtual representatives. The appearance of the users will be customized for their own avatars. So that the users can interact with each other through the avatar themselves. Moreover, the environment can be transformed by creating the virtual intended objects, together with communicate, collaborate and so on (Fetscherin and Lattemann, 2008). To view the content and travel around in the SL, users can control their own avatar by typically using the keyboards or mouse from the computer by moving it to the directions, left or right, or even flying by choosing the flying button shown on the screen (The Schome Community, 2007). The avatar themselves are called the "residents" of SL. They can easily communicate via chat by simply texting or voice communication via their connected microphones. Though the program itself seems to be advanced in terms of creating the program, it is the users' friendly program even the ones with no programming experiences. The mentioned reasons can affirm why the SL was rapidly widespread globally. That's why it brought the attention of the educators in applying this attractive and interesting program into their teaching and learning (Bainbridge, 2007). Though there are some limitation such as the high speed of the internet while being online required, its 3D social interaction and realistic visualization definitely concur the limitation is worth effort (Braman,Vincenti, Arboleda & Jinman, 2009). Though becoming more interests in conduction the researches and studies concerning the SL is being subtle, the limited studies have been conducted concerning applying it into the classroom specifically for English language learning.

Teaching and Learning English Communication Skills

The English communication four skills, listening, speaking, writing, and reading are very important to both for education or business. That is the reason why so many language learners are very interested in improving these skills (Zhang, 2009). Because many of them aspire to professional careers in English dominant communities, the coming decade will see increasing pressure placed upon EFL high school, college, and university graduates to possess excellent skills in both speech and writing. EFL teachers commonly turn to widely accept a second language or a foreign language (L2) teaching methods and materials. Though a lot of materials supporting teaching L2 learners developing English communication skills, they seem not to be successful because of many reasons. Some of the students are required to study English in the classroom while being an undergraduate for their degree (Murphy, 1991). In addition to speaking, listening skills, receptive skills should be focused as it plays an important role in communication curricula because high school and college students are expected to enroll in lecture-centered courses during their earliest experiences within mainstream classrooms. Lecture-centered teaching in mainstream classrooms requires that EFL college students function effectively as listeners from the very beginning of their academic careers.

Within most classroom settings, listening serves as a primary channel for learning while reading is also vital since the students are required to read for any lessons provided effectively. Moreover, the skill of reading comprehension has been ranked very important by the employers who will consider if they will employ the graduates in the future (Casner-Lotto & Barrington, 2006). Because little attention is given to the students' listening abilities in other academic preparatory courses (Chamot, 1983), listening and connections between listening, speaking, and pronunciation emerge as central components of EFL oral communication (Murphy, 1991). To master this skill, not only the activities concerning listening skill solely, but the speaking tasks are required to be implemented since they both need to be together in order that L2 learners can master English oral communication skills (Zamel & Sheikh Ibraham, 1985).

Second Life for English Communication Classes

Given the potentials of the second life in EFL classrooms, Hismanoglu (2012) investigated the future of second life as a new dimension in foreign language learning and teaching especially for the English communication classes. His paper aims to zoom in the benefits of using SL in foreign English Language classroom. He found out that SL provides a conducive learning environment to learners which teacher should make use of as either a main approach or a supplemental to their methodologies. Further, he noted that SL opens an avenue for students to enhance their own learning at their own pace while nurturing other communication skills like collaboration and sharing. SL, as he noted, assimilate a real-life language learning environment that made it effective language learning platform in terms of communication skills.

Understanding the learners' views in different countries are essential in implementing a new platform for learning. Although there were several works done to vouch its positivity, it is likewise significant to explore how other learners from different regions view SL. In 2012, Baram, Cukurbasi, Polak and Dogusoy took a step in looking into the potentials of second life in education through second life users' profiles and views. A total of 118 participants were involved in the study. Using a likert scale questionnaire, the study revealed that majority of the SL users did not have specific thoughts about the applicability of SL in education and are not willing to participate in any activity that involved it. Further, the view SL is not stretched to its potentials being an educational learning platform which is of opposition to many findings that considered it positive. Although there are quite a few who saw the positive side on it. It was revealed though that students' learning is quite positive when action learning principles were incorporated. This was evident on one of the responses of the participants which state that "SL makes me communicate better with people". The study then, concluded that SL may reduce learner-learner distance in e-learning in addition to reducing teacher-learner distance.

In a similar study, Brooks (2016) explored the use of second life as applied in teaching. In her article, she looked at the ways virtual world was employed within the traditional "brick and mortar" language classrooms and assessed its effectivity. The findings revealed that SL can be integrated in the language communication classroom in various ways and have shown effectiveness than other virtual platforms. Seeing the clear benefits of SL, it was recommended that quantitative approaches may be used in exploring its effectiveness particularly focus on the macro-skills, communication skills. Further, it was also noted that the design of SL is crucial to learners; thus, a creative design is necessary to ensure seamless learning.

Despite the negative outlook of students' perception on SL as an educational learning platform in Turkey, several studies continue to explore its potentials as a learning tool. Chiang, Yang, Huang and Liou (2014) investigated the impact of a 3D virtual learning environment based on Second Life on student motivation and achievement in learning English as a second language especially in English communication class. Twenty-one students, one English instructor and one tutor participated in their study. Using one-way ANOVA, the results revealed a positive influence on the participants' self-efficacy on English learning in 3D virtual worlds and its effectiveness in learning English communication. The study concluded that 3D virtual worlds provide situated learning environments and thematic learning scenarios, as well as socialization and interactive communication environments for students. Learners who have higher intrinsic goal orientation or higher extrinsic goal orientation of English communication learning in Second life or higher self-efficacy would have higher achievement. Thus, the paper shed positive light, a reverse view of the case of Turkey, on the potentials of SL in employing as learning platform in educational institutions. SL may demonstrate enhanced learning achievement among students.

Ince et al. (2014) developed a 3-dimensional interactive multiuser and multi-admin IUVIRLAB featuring active learning methods and techniques for university students and to introduce the virtual laboratory of the Istanbul University and show its effects on students' attitudes on communication skills and its laboratory. Based on the study, students did not have any technical problems in using the 3-dimensional interactive tool. The study also demonstrated students' positive outlook at it and their high motivation in using the tool for learning. It was also noted that students were at ease using the tool and were convenient for learning.

As some researches support the effectiveness of SL in teaching, Hassan, Dzakiria and Idrus (2016) focused on students' perception. They intended to elicit Iraqi students' perception on SL's potential as a virtual platform to improve English communication learning. In carrying out their study, a qualitative case study was employed through interviews as their data collection technique. Based on the findings, the Iraqi students' showcase an affirmative response on the potentials of SL in enhancing their English language skills and proficiency through their interaction with the avatar which helped them reduce language anxiety and this making learning English more interesting.

One of the challenges that every foreign language learner is language anxiety especially for communication. It is what hampers the development of every learner's language skills. This means learners' perception of learning their target language has a huge impact in the success of their development. Looking at this perspective, Couto (2011) proposed a study to look at the impact of Second Life in learners' foreign language anxiety. Two stages were considered in carrying out the study; first was a native English speaker was paired with a native Spanish speaker to complete number of speaking activities; and the second was as same as the first, but it will have a randomly selected native Spanish speaker which was conducted in a university. After having performed the activities, participants were asked to answer a Foreign Language Classroom Anxiety Scale (FLCAS). The results have shown that using SL, foreign language anxiety was reduced; however, the study identified some areas of opportunities like low number of student participants and instruments were mainly about students' impression that will require more empirical approaches such as Galvic Skin response and heart monitoring to strengthen the research to arrive at more conceive results.

Lan and Lin (2016) investigated how mobile seamless technology like SL can be used to enhance the pragmatic competence of learners. Their study noted that contextual influence on FL/SL has been an important issue in SLA. In the same vein, learners' context affects learning and the amount of transfer which is vital in enhancing pragmatic competence. Through their study, they confirmed that active involvement play an important role in the success of social communication which suggests that a careful design of learning tests and timeliness are essential in making mobile seamless technology effective.

In a recent study, Wang (2012) explored another technology-enabled tool for enhancing oral English teaching strategies. Using descriptive analysis, her study revealed a positive attitude toward teaching strategies based in SPOC. Because of this development, six teaching strategies were suggested such as text guidance, video demonstration, PPT assisted learning, micro-lecture learning, self-testing and group work. These strategies may further inform the design of the proposed study employing SL framework.

The literatures cited show the potentials of Second Life as an educational learning platform. Wang et al. (2012) noted that SL showed positive impact to students as they have become highly motivated which Chiang et al. (2014) considered to be an important aspect in improving higher achievement. Hismanoglu (2010) reported that SL presented positive points as most learners see learning in a more authentic learning space for SL resembles that of a real-life experience. Because of the authentic learning space, students and teachers alike are able to reduce social distance which often creates a wall for learning. Baram et al. (2012), in their paper, mentioned that SL promotes an ease of learning. This then affirms that SL may be a viable educational learning space as Wang (2012) noted it complements teaching. Although there are number of positive points, it is equally important to look at how it can be implemented as Brooks (2016) asserted, design is critical to the learning of students. In doing this more conducive and effective, it may be relevant to subscribe to Wang's (2012) suggested teaching strategies that compliment learning such as text guidance, video demonstration, PPT assisted learning, micro-lecture learning, self-testing and group work. Thus, the proposed study provides an opportunity in developing a SL learning tool and explore on how it can enhance the English communication skills in the Thai classroom. The results of the study may offer two salient contribution: first, it can provide a new learning options, that is the SL-driven learning tool, which can also

be used for more exploration on how it impacts both the teacher and students in the English as a Foreign Language Classroom; second, it will provide a different perspective on how SL is viewed, implemented and designed as informed by the Thai context.

METHOD

The study employed a quasi-experimental research design. It used the Test of English for International Communication (TOEIC) for the pre and posttest.

Participants

The study involved 40 Thai freshmen students who were studying the university required English course at a comprehensive university in Thailand. There were 16 males and 24 females studying in two categorized majors, 17 students from social studies and 23 students from science majors. In terms of the numbers of spending time on computers weekly, they were divided into three groups, which were 5-6 hours, 7-9 hours, and 20 hours or more. Talking about their English learning experiences, they all have been studying English since they were at the secondary and high school levels as compulsory subjects following the Thai education system requirement. All of them have passed the similar minimum English requirement admission examination for getting to the university. Because of their similar Englsih scores of the admission examination, they have been, then, placed in this course together. And they can be assumed that their English background was quite at the similar level.

Data Collection Tools

In collecting the data, the test of English for international communication (TOEIC) was used. TOEIC is considered as a world-wide standardized test for examining the English communicative skill levels which is universally popular as almost 3 million registered candidates a year (Mark, 2003). The researcher has employed this test in this study in order to explore the development of students' English communicative skill. The students in this study were initially informed regarding the test format and shown the samples of each category of the test before the pre-test begins. They were, then, asked to finish the first part of the test which was listening questions including 100 questions divided into different categories: the photograph, question-responses, conversations, and talks. After the first part has been finished, the examinees were asked to continue finishing the other 100 reading questions contain of the completion, the cloze-test, and the reading passage parts. They have had approximately 75 minutes to have all questions finished. For the post-test, similar procedure has been done at the end of the semester before the scores had been finally analyzed. Though it seems only two domains of the tests were included in the TOEIC test, listening and reading, the study by Donald and Powers (2015) confirmed that the 2300 TOEIC test takers' communication skills results as the target performance domain in their study can be possibly assessed by specific domain not only in that domain but in other related domains as well in a holistic way.

Research Procedure

The instruction of the course has been given four hours a week divided into two periods for the whole semester. To master the English communication skills, students were required to participate in the Second Life virtual classroom provided by the teacher. The students have been informed earlier about the specific periods for each class by having discussion and agreement among teacher and students. So that the class periods were varied depending on the avalability and the agreement. The class instruction procedures can be clearly seen in Figure 1.

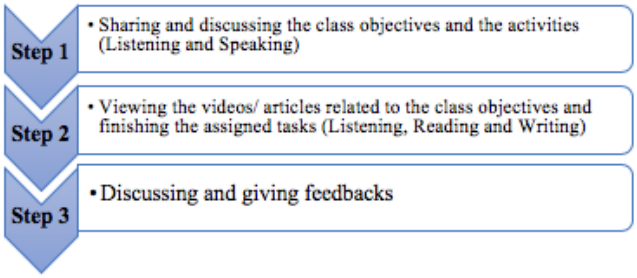

Figure 1. Class instruction procedures

Figure 1. portrays that after the students and the teacher have logged into the Second Life virtual world, the teacher started to inform the class objectives and the tasks going to be assigned for each period. The students were given a chance to ask or discuss about what they are going to participate. For example, students were asked to watch the videos related to some specific topic which was hidden in somewhere around them and they would be asked questions after 15 minute long activity. After the students enjoyed the assigned tasks, the teacher asked the questions related to that videos or articles. It was the time for practicing speaking skill together with writing skill if the teacher asked to write any reflections. The listening practices from enjoying the videos would give them opportunity to develop their listening skill thoroughly. Giving feedbacks for 10 to 15 minutes from the teacher was the last step before the class ended.

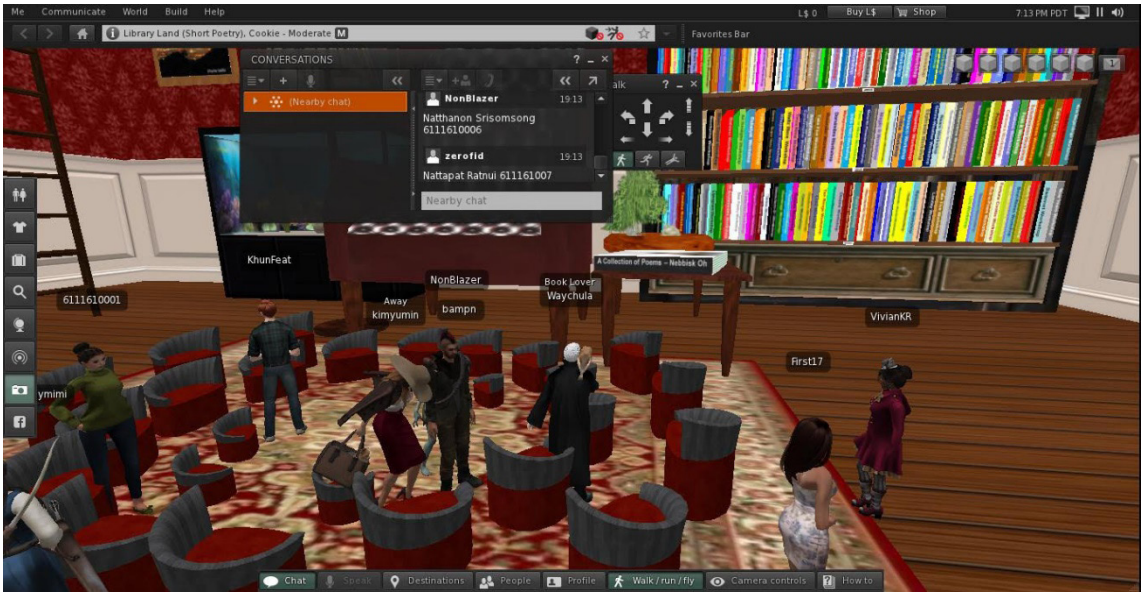

Figure 2. Second life English communication class

Data Analysis

Though the development of English communication skills were assessed in order to confirm the results of the treatment of the study, other variables such as genders, students' majors of study, and the numbers of hours spent on computers weekly were also monitored in order that the results of the treatments can be a strong evidence to support the research objectives. The data from pre-test and post-test were, then, analyzed by applying the t-test and one-way ANOVA as the results from the t-test itself can show a difference between two groups is unlikely to have occurred because the sample happened to be atypical. This statistical significance is determined by the size of the difference between the group averages, the sample size, and the standard deviations of the groups, and the one-way ANOVA is used to determine whether there are any statistically significant differences between the means of two or more independent (unrelated) groups of variables: male/female, social science/ science, and the numbers of hours spent. The results can affirm if there is any different impact of the different variables on developing students' English communication skills.

FINDINGS

Table 1. Descriptive statistic for students' TOEIC scores

	TOEIC Scores		*Total*
Variables	***Mean***	***S.D.***	*Number*
Post_Male	384.06	72.875	16
Pre_Male	318.13	76.002	16
Post_Female	403.75	78.564	24
Pre_Female	339.79	75.893	24
Post_Soc	408.53	76.990	17
Pre_Soc	344.41	61.183	17
Post_Sci	386.52	75.610	23
Pre_Soc	321.30	84.883	23
Post_5-6 hrs	360.50	57.949	10
Pre_5-6 hrs	304.50	60.067	10
Post_7-9 hrs	397.69	72.704	13
Pre_7-9 hrs	330.77	75.301	13
Post_20+ hrs	415.29	83.936	17
Pre_20+ hrs	347.06	83.555	17

After all the research methodology has been done, the data collected was analyzed and shown in various categories as follows:

Students' English Communication Skill Development Comparisons

The following analyzed data have clearly shown the students' English communication skill development in various aspects: the descriptive statistic for students' TOEIC scores, mean scores comparison, descriptive statistic for scores of the post-test, test of homogeneity of variances, and mean score comparison by ANOVA.

The TOEIC scores of the 40 students with different variables are clearly shown in Table 1. All variables of the post-test scores considered in the study were higher than the pre-test ones. In terms of genders, both males and females had higher post-test scores than the pre-test, yet the females achieved better than males (Female mean = 403.75, Male mean = 384.06). In addition to the gender variables, the majors of students were counted. Though both social science and science students performed better in the post-test, the students from the social science majors performed better than the students from science (Social science mean = 408.53, Science mean = 386.52). Another variable counted in the study was the number of hours the students spent on their computers weekly divided into three groups, 5-6 hours, 7-9 hours and 20 hours and more. There was no difference of development in terms of the post-test compared to the pre-test as all groups performed better in the post-test. Interestingly, the higher number they spent weekly, the better scores they performed in the post-test (5-6 hrs. = 360.50, 7-9 hrs. = 397.69, 20+ hrs. = 415.29).

Table 2. Mean score comparison (Pre-test and Post-test)

		Paired Differences					t	df	Sig. (2-tailed)
	Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
				Lower	Upper				
TOEIC	PostMale - PreMale	65.938	39.252	9.813	45.022	86.853	6.719	15	.000
	PostFemale - PreFemale	63.958	41.231	8.416	46.548	81.368	7.599	23	.000
	PostSoc - PreSoc	64.118	44.414	10.772	41.282	86.953	5.952	16	.000
	PostSci - PreSci	65.217	37.340	7.786	49.070	81.364	8.376	22	.000
	Post1 - Pre1	56.000	33.649	10.641	31.929	80.071	5.263	9	.001
	Post2 - Pre2	66.923	38.217	10.600	43.828	90.018	6.314	12	.000
	Post3 - Pre3	68.235	45.756	11.097	44.710	91.761	6.149	16	.000

To be more specific, the paired diferences in Table 2 show the significant data of the pre-test and post-test scores analyzed by applying t-test in all variables. Based on the mean comparison analysis by the use of t-test for dependent sample, it shows that there was significant mean score differences of the pretests and the posttests of the TOEIC tests at .05 level (sig. ranked from 0.000 to 0.001). That means all posttest mean scores were greater than all pretest mean scores. All students who have been in the study had significantly improved their English proficiency in terms of communication skill specifically.

Table 3. Descriptive statistic for scores of the Post-test

TOEIC Post-test Scores			Total Number
Variables	**Mean**	**S.D.**	
Male	384.06	72.875	16
Female	403.75	78.564	24
Soc	408.53	76.990	17
Sci	386.52	75.610	23
5-6 hrs	360.50	57.949	10
7-9 hrs	397.69	72.704	13
20+ hrs	415.29	83.936	17
Total			**40**

From Table 3, the TOEIC poste-test scores were shown in mean and S.D. of different variables. Even the numbers of female students were higher than males', the mean scores of females were higher than males at 403.75 and 384.06 respectively. In terms of their majors of study, the students from social science majors have performed quite better than the science students with the scores of 408.53 and 386.52 respectively. Interestingly, the students who spent a lot more on computers weekly had the highest scores with the mean of 415.29 compared to other groups who performed lower scores at only 397.67 for the 7 to 9 hours spent a week group, and the least at 360.50 mean scores among the group of spending 5 to 6 hours on computers a week. It can be clearly seen that the higher numbers of hours they spent on computers a week, the better scores they achieved in the TOEIC post-test.

Table 4. Test of homogeneity of variances

		Levene Statistic	df1	df2	Sig.
TOEIC Posttest Mean	Male Female	.561	1	38	.459
	Soc Sci	.004	1	38	.947
	5-6 hrs	2.186	2	37	.127

The table of the test of homogeneity of variances indicated that all variances of the mean scores of TOEIC tests were significantly equal at .05 level which means all the variables shown in Table 4 affirmed that the students performed better in the TOEIC post-test compared to the pre-test ones (Sig ranked from .127 to .947).

Table 5. Mean score comparison by ANOVA

	Variables		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
TOEIC Posttest Mean	Male / Female	Between Groups	3720.938	1	3720.938	.638	.429
		Within Groups	221623.438	38	5832.196		
		Total	225344.375	39			
	Social / Science	Between Groups	4734.401	1	4734.401	.815	.372
		Within Groups	220609.974	38	5805.526		
		Total	225344.375	39			
	Hours	Between Groups	18967.576	2	9483.788	1.700	.197
		Within Groups	206376.799	37	5577.751		
		Total	225344.375	39			

According to the ANOVA table comparing mean scores above, it revealed that there was no significant mean differences of any types of post-test mean scores of different variables: male/female, social science/ science, and the numbers of hours spent at .05 level (Sig. ranked from .197 to .429 respectively). To clarify, students with different backgrounds which were gender, fields of study, and hours of spending the computers have indifferent mean scores in their communication skills.

DISCUSSION AND CONCLUSION

The findings of the study mentioned earlier have brought various aspects related to the research objectives. The following sections will be discussed regarding the main objective of English communication skill development after applying the Second Life in teaching and learning, the related factors or other variables counted in the study, and how the students in the study found themselves after the semester finished.

Developing English Communication Skills through the Second Life

In terms of English communication skill development, applying the Second Life in the English language classroom is highly effective as the TOEIC post-test scores of all students in this study with different variables are considered higher than the pre-test ones. Based on the mean comparison analysis by the use of t-test for dependent sample, it showed that there was significant mean score differences of the pretests and the posttests

of the TOEIC tests at .05 level (sig. ranked from 0.000 to 0.001). That means all post-test mean scores were greater than all pretest mean scores. Therefore, all students who have been in the study can be confirmed that they had significantly improved their communication skills. This phenomenon can be affirmed by Hassan, Dzakiria and Idrus (2016) previous similar study. Based on their findings, the Iraqi students' showcase an affirmative response on the potentials of SL in enhancing their English language skills and proficiency through their interaction with the avatar which helped them reduce language anxiety and this making learning English more interesting so that the students' communication skills have been improved. Not only the earlier mentioned study, but Lan and Lin (2016) also confirmed that active involvement play an important role in the success of social communication which suggests that a careful design of learning tests by applying three-dimensional platform like SL was essentially important. In addition, the study done by Wu (2017) also exposed the results in similar direction. To be more specific, the students' skills development has been explored through another technology-enabled tool like SL for enhancing oral English teaching strategies. Using descriptive analysis, her study revealed a positive attitude toward teaching strategies based in SPOC. Because of this development, six teaching strategies were suggested such as text guidance, video demonstration, PPT assisted learning, micro-lecture learning, self-testing and group work. These strategies may further inform the design of the proposed study employing SL framework.

Impacts from Different Variables on Developing English Communication Skills through Second Life

Though the gender difference was another variable considered if there were any impacts on developing students' English communication skill through the Second Life, the results clearly show that the significant data of the pre-test and post-test scores analyzed by applying t-test in all variables clearly confirmed the students' development based on the mean comparison analysis by the use of t-test for dependent sample. It shows that there was significant mean score differences of the pre-tests and the post-tests of the TOEIC tests at .05 level (sig. ranked from 0.000 to 0.001). That means all posttest mean scores were greater than all pretest mean scores. All students who have been in the study had significantly improved their English proficiency in terms of communication skill specifically. The same confirmation has been also confirmed by the previous study done by Bani Hani (2015). The study involved 20 students where five to them were males while the rest were females. The study revealed that students were more competent in utilizing virtual platform devices to read the appointed texts, send questions, read and supply immediate feedback to peers. The study concluded that additional support in that the students' computer self-efficacy and attitudes were essence aspects which influenced the success of virtual learning. It also revealed that gender was not a prime ease which affected the self-efficacy and attitudes toward the virtual learning. In addition to the gender variable, the majors of students were counted. Though both social science and science students performed better in the post-test, the students from the social science majors performed better than the students from science. However, there was no different significance of applying Second Life for developing their English communication skills as the test of homogeneity of variances indicated that all variances of the mean scores of TOEIC tests were significantly equal at .05 level. It can be said that all the variables shown including the variable of the different majors of study affirmed that the students have developed their English communication skills. This phenomenon has been confirmed by the research done by Ince et al. (2014). The research was about developing a 3-dimensional interactive multiuser and multi-admin IUVIRLAB featuring active learning methods and techniques for university students who were from different majors of study and to introduce the virtual laboratory and show its effects on students' attitudes on communication skills and its laboratory. Based on the study, students did not have any technical problems in using the 3-dimensional interactive tool due to their different study fields. It was also noted that students were at ease using the tool and were convenient for learning. The number of hours spent on computers by the students was the last variable considered in this study. Though all the groups have performed better in the post-test compared to the pre-test, the higher number they spent weekly, the better scores they performed in the post-test (5-6 hrs. = 360.50, 7-9 hrs. = 397.69, 20+ hrs. = 415.29).

CONCLUSIONS

The result concludes that, based on the findings, Second Life has been found highly effective in developing students' English communication skills. Exploring other variables such as gender differences, the different majors of the study, and the numbers of hours spent by the students on their computers, the paired differences show the significant data of the pre-test and post-test scores analyzed by applying t-test in all variables shows that there was significant mean score differences of the pre-tests and the post-tests of the TOEIC tests. The ANOVA comparing mean scores also revealed that there was no significant mean differences of any types of the post-test mean scores of different variables: male/female, social science/ science, and the numbers of hours spent. To clarify, students with different backgrounds which were gender, fields of study, and hours of spending the computers have indifferent mean scores in their communication skills. It means the students have developed there English communication skill through the Second Life classroom platform.

The present study may be used as a basis in expanding studies such as this kind. It may also serve as a model in implementing virtual-enabled language classes. Despite its positive contributions, limitations of the study concur with Sarac's (2014) work where implementing a Second Life-directed language classroom is expensive and requires logistics such as strong internet connection and a high-performing device. It is also important to have a learning design specialists who are technologically adept in virtual learning tools as their roles will be salient in training teachers in creating contents, designing tasks and activities using other tools of learning.

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EVALUATION OF TEACHERS' TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE WITHIN THE FRAMEWORK OF EDUCATIONAL INFORMATION NETWORK AND OTHER VARIABLES

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Received: 01/10/2019 **Accepted:** 10/05/2020

ABSTRACT

The aim of this study is to examine the relationship between Technological Pedagogical Content Knowledge (TPACK) of teachers teaching at different levels of educational institutions and demographic information about them as well as their technology and Educational Information Network (EIN) use. The participants of the study were determined by using stratified sampling method from the teachers teaching in state-run primary schools, secondary schools and high schools in Eskisehir in Turkey. 364 teachers voluntarily participated in the study by filling out the data collection tool. The first part of the survey includes questions to collect demographic data about the participants as well as the ones related to their technology and EIN use. The second part involves TPACK scale developed by Horzum, Akgun and Ozturk (2014). According to the results of the statistical analysis, the teachers find themselves competent in terms of TPACK factors and there are significant differences between TPACK factors and demographic information about the participants as well as their technology and EIN use. It is believed that increasing technology knowledge of teachers will also improve their pedagogy and content knowledge. Therefore; it is suggested that more studies should be conducted which combine technology, pedagogy and content knowledge.

Keywords: Technological pedagogical content knowledge, TPACK, use of technology, educational information network.

INTRODUCTION

Teachers should have various competencies beyond their content knowledge so that they can teach effectively. The educator who dealt with these competencies for the first time within the framework of "pedagogical content knowledge" was Shulman (1986) (Yilmaz, 2015). According to this theoretical framework, teachers should be equipped with considerable amount of content and pedagogy knowledge so that they can teach course contents effectively. Due to technological advancements, it is acknowledged that pedagogical content knowledge is not enough for effective teaching, so technological knowledge has been considered a new teaching competence since then. Effective and efficient use of blackboard, whiteboard, projector, computer and interactive board in educational environments is important as part of the current efforts to integrate technology into education to achieve higher quality (Akyuz, Kurnaz, Pektas & Memis, 2014). In addition, technology knowledge includes not only the use of technological devices but also all other devices, methods and processes as well as management and control mechanisms which function like a bridge between scientific knowledge and practice (Alkan, 1998). Thus, content, pedagogy and technology knowledge as well as their relationships with each other become important issues when teacher competencies are considered.

The structure that involves technology, pedagogy and content knowledge is called Technological Pedagogical Content Knowledge (TPACK). This term was suggested by Mishra and Koehler (2007) by extending Pedagogical Content Knowledge (PCK), which was coined by Shulman in 1986, to include educational technologies as well (Canbolat, 2011). Technological Pedagogical Content Knowledge (TPACK) is a theoretical framework developed in order to define teachers' technological pedagogical content knowledge in regard to effective interaction between technology and education.

Each component of TPACK is defined as follows (Koehler & Mishra, 2008): Content knowledge refers to the knowledge to be taught and learned. Pedagogy knowledge is not about the content to be taught but about how this content is taught, and the methods and strategies applied in the classrooms. Technology knowledge is the knowledge teachers have regarding the use of technological devices ranging from the standard ones such as blackboard and chalk to advanced technological devices such as computers. Technological content knowledge is about which technology is appropriate and what technology offers as opportunities and limitations while teaching the content. Pedagogical content knowledge refers to the knowledge about how a particular content should be taught. Technological pedagogical knowledge covers all kinds of knowledge about how technological devices are used in educational practices and how educational processes change with technology use. Technological pedagogical content knowledge (TPACK) refers to the knowledge about how technology can be used to teach a particular content through various constructive methods, develop new theories, strengthen already existing theories and clarify the meanings of complex concepts.

Effective technology integration requires knowledge about the relationships between content, technology and pedagogy knowledge because none of them is sufficient itself for the realization of effective learning (Koehler, Misra & Yahya, 2007). In addition to the necessity of having sufficient amount of content, technology and pedagogy knowledge, it is essential that these types of knowledge should be combined effectively (Perkmen & Tezci, 2011).

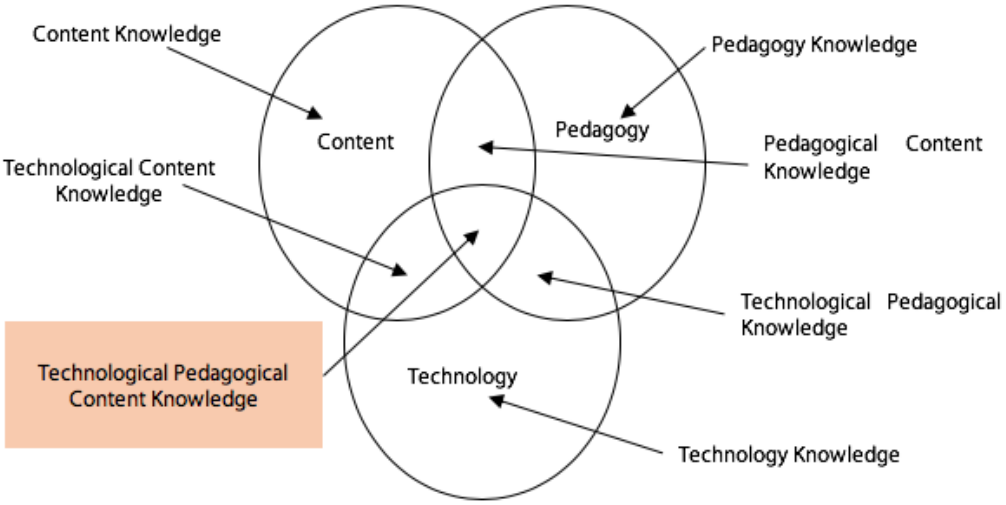

Figure 1. TPACK framework and knowledge components (Koehler and Mishra, 2008)

Technological pedagogical content knowledge (TPACK), which is the intersection of content, pedagogy and technology, is the knowledge about the combination of necessary pedagogical strategies, methods and techniques to teach a particular content by using technology (Koehler & Mishra, 2008, p.12).

Just like other fields, technological developments considerably affect the field of education as well. Use of technology in education is becoming more and more popular in educational institutions because teaching and learning process are more efficient and motivating thanks to technological developments (Temizyurek & Unlu, 2015). In this respect, Turkish Ministry of Education established EIN program in 2011 to integrate new educational approaches to educational practices (Ozen, 2019).

Effective use of technology in education has a positive effect on academic achievement (Teo, Ursavas & Bahcekapili, 2012). Advancements in technology bring about some changes in students' learning, which, in turn, requires teachers to update their knowledge and competencies accordingly. Therefore, it is essential to measure teachers' and preservice teachers' techno-pedagogical educational competencies. TPACK is considered an appropriate model to develop a scale aiming to measure and evaluate teachers' and preservice teachers' background knowledge about technology integration (Onal, 2016). In the literature, there are studies that examine how successful educators use content, pedagogy and technology knowledge in educational processes as well as those which are conducted to develop new scales integrated to TPACK or adopt already existing scales (Balcin & Ergun, 2018; Bagdiken & Akgunduz, 2018; Yarar, 2018; Ay, 2015; Karadeniz & Vatanartiran, 2015; Ay, Karadag, & Acat, 2015; Kartal, Kartal, & Uluay, 2016). These studies generally focus on determining TPACK competencies of teachers from various disciplines and educational levels and examining the correlations between TPACK and various variables (Yilmaz, 2015).

This study is expected to contribute to the literature by presenting findings related to the effects of "access to technology", "participation in in-service training programs" and "demographic information about participants such as gender, teaching specialization, age, duration of working and institution" on TPACK levels and by combining EIN use and TPACK framework. Therefore, this study aims to determine technological pedagogical content knowledge of primary school, secondary school and high school teachers in Eskisehir – a city located in Turkey-, to examine whether TPACK factors differ according to demographic variables as well as various variables related to technology and EIN use and, finally, to offer some suggestions for further practices and studies under the light of these findings. As a result, this study tries to answer the following questions:

1. What is the level of teachers' technological pedagogical content knowledge (TPACK)?
2. Do TPACK levels of teachers differ according to gender, teaching specialization, age and educational institution levels?
3. Do TPACK levels of teachers differ according to "access to technology", "technological competencies" and "participation in in-service training programs"?
4. Do TPACK levels of teachers differ according to EIN use levels of teachers?

METHOD

The study used cross-sectional survey method, which is a quantitative research method (Buyukozturk et.al, 2012). This method aims to examine a situation by collecting data at one time and exploring the relationships among variables (Baris, 2015).

Participants

The population of the study is the teachers working in state-run schools in Eskisehir (primary schools, secondary schools and high schools) in 2018-2019 academic year. The study group consists of 364 teachers chosen from different regions and districts through stratified sampling method. This method is used when units of the population differ in terms of their characteristics, and units are classified under sub-groups called strata according to certain criteria. Here, study group is determined by randomly choosing samplings for each strata (Kilic, 2013). The demographic information about the participants is displayed in Table 1 and the data about their technology use in Table 2.

Table 1. Information about teachers' gender, teaching branch, age and institution

Characteristics		n	%	Characteristics		n	%
Gender	Female	228	62.6	Institution	Primary School	95	26.1
	Male	136	37.4		Secondary School	202	55.5
	Total	364	100		High School	67	18.4
					Total	364	100
Age	<30	23	6.3	Teaching Specialization	Social Science courses	137	37.6
	30-39	194	53.3		Science courses	106	29.1
	40-49	114	31.3		Basic Education	83	22.8
	>50	33	9.1		Sport/Art	38	10.4
	Total	364	100		Total	364	100

According to Table 1, most of the participants are female (n=228, % 62.6), within 30 - 39 age range (n=194, %53.3), secondary school teachers (n=202, %55.5) and teach a social science course (n=137, %37.6). Subjects taught in these schools were classified as follows: social science courses (geography, religion, literature, social sciences, Turkish, foreign language and special education); science courses (science, mathematics, technology); sport-art courses (physical education, visual arts, music); basic education courses (class teachers and pre-school teachers).

The data about participants' EIN use and technology knowledge were collected in the first part of the data collection tools. The related questions and the distribution of the replies are presented in Table 2. Accordingly, majority of the teachers (n=296, %81.3) have access to the internet in their schools, label their technological competencies as "good" (n=183, %50.3), have received in-service training about technology use (n=249, %68.4) and use EIN when needed (n=309, %84.9).

Table 2. The data about teachers' technology knowledge and EIN use

Characteristics		n	%	Characteristics		n	%
In your institution, can you access the technology you need?	Yes	296	81.3	Have you received any in-service training about technology use?	Yes	249	68.4
	No	60	16.5		No	109	29.9
	Total	356	97.8		Total	358	98.4
How do you define your technology use level?	Very good	44	12.1	How do you define your EIN use?	Regularly	39	10.7
	Good	183	50.3		When needed	309	84.9
	Poor	6	1.7		Never	16	4.4
	Total	363	99.7		Total	364	100

The Data Collection Tool

The data for the study were collected through a survey which was administered face to face. The first part of the survey includes questions aiming to collect demographic data and the data regarding the technology use of the participants. In the second part of the survey, "Technological Pedagogical Content Knowledge Scale" developed by Horzum, Akgun and Ozturk (2014) was used after getting necessary permissions from the researchers. This 51-item scale has 7 factors: "Technology Knowledge", "Content Knowledge", "Pedagogy Knowledge", "Pedagogical Content Knowledge", "Technological Content Knowledge", "Technological Pedagogical Knowledge" and "Technological Pedagogical Content Knowledge". The scale has 5-point Likert scale format (1: I do not agree at all, 5: I totally agree). Table 3 below presents internal consistency coefficients obtained both in the original study and the current study. According to these values, "Technological Pedagogical Content Knowledge Scale" is a reliable data collection tool.

Table 3. Reliability of Technological Pedagogical Content Knowledge Scale

Factors	Number of Items	The α value in the adaptation study	The α value in the current study
Technology Knowledge	6	.85	.90
Pedagogy Knowledge	7	.82	.86
Content Knowledge	8	.85	.93
Technological Content Knowledge	6	.84	.88
Pedagogical Content Knowledge	8	.87	.76
Technological Pedagogical Knowledge	8	.89	.93
Technological Pedagogical Content Knowledge	8	.88	.93

Data Analysis

The responses provided for 51 items in this 5-point Likert type scale were interpreted by determining factor points for each factor by using SPSS® StatisticsSubscription program. The data obtained were analyzed by using descriptive statistics such as frequency, percentage, and means etc. Independent samples t-test was used for the following analyses: changes in Technological Pedagogical Content Knowledge according to the variables; paired comparisons for "gender", "access to technology" and "receiving in-service training on technological issues" variables. One-way ANOVA was used for all other variables. Finally, Post Hoc tests were used depending on homogeneity of variance distribution in order to determine which groups account for significant differences between the groups obtained from variance analyses. The results were tested at $p<.05$ degree of significance.

FINDINGS

The findings from the analyses regarding TPACK sub-factors according to demographic data about the participants as well as the data about their technology use and EIN use are presented below.

Findings Regarding Teachers' Technological Pedagogical Content Knowledge

Teachers' perceptions about their technological pedagogical content knowledge are displayed in Table 4 below. When the means of the responses provided for 5-point evaluation are considered, it is seen that means are generally high and these high scores are quite close to 5, which is the maximum score. Although the lowest mean was calculated for "technology knowledge" component, it can be said that teachers find themselves competent in terms of TPACK and all its components.

Table 4. Teachers' Technological Pedagogical Content Knowledge

Factors	$\bar{X}$	ss
Technology Knowledge	3.74	0.67
Pedagogy Knowledge	4.12	0.52
Content Knowledge	4.25	0.58
Technological Content Knowledge	3.93	0.62
Pedagogical Content Knowledge	4.20	0.57
Technological Pedagogical Knowledge	4.04	0.62
Technological Pedagogical Content Knowledge	4.03	0.62

Findings Regarding Demographic Variables Affecting Teachers' Technological Pedagogical Content Knowledge

The data regarding study-specific demographic variables, which are gender, teaching specialization, age, institution, are presented below.

Findings Regarding "Gender and Specialization" Variables

Teachers' technology knowledge, which is a factor of TPACK, significantly differs according to gender (sig.=.015<.05). Male teachers' perception about technology ($\bar{X}$ =3.85) is higher than female teachers ($\bar{X}$ =3.67).

One-way ANOVA was used to identify whether TPACK factors differ according to teaching specialization, age, duration of work and educational institutions variables. The ones with significant differences are displayed in Table 5 below.

Table 5. ANOVA results regarding TPACK and teaching branch variable

Factors	Specialization	Branch	n	$\bar{X}$	ss	F	p
Technology Knowledge	Science courses		106	3.92	--	4.93	--
		Social science courses	137	3.74	.086		.161
		Basic education	83	3.58	.097		.004
		Sport - Art	38	3.56	.013		.029
Content Knowledge	Science courses		106	4.35	--	2.89	--
		Social science courses	137	4.25	.073		.692
		Basic education	83	4.11	.083		.022
		Sport-Art	38	4.21	.108		.697
Technological Content Knowledge	Science courses		105	4.04	--	4.94	--
		Social Science courses	137	3.99	.071		.877
		Basic Education	82	3.75	.099		.016
		Sport-Art	38	3.79	.117		.139
Pedagogical Content Knowledge	Basic Education		82	3.98	--	6.62	
		Science courses	137	4.33	.089		.000
		Social Science courses	105	4.24	.084		.005
		Sport-Art	38	4.12	.119		.807
Technological Pedagogical Content Knowledge	Basic Education		82	3.89	--	3.70	
		Science courses	137	4.12	.090		.012
		Social Science courses	105	4.10	.085		.013
		Sport-Art	38	3.86	.109		.804
Technological Pedagogical Content Knowledge	Sport - Art		38	3.86	--	3.70	
		Science courses	137	4.12	.112		.027
		Social Science courses	105	4.10	.115		.031

A significant difference was found between teachers' teaching specializations and their Technology Knowledge ($F_{(3-364)}$=4.93, sig:.002<.05). Since variances were distributed homogenously (sig:.208>.05) and the distribution in sampling groups was not equal, Hochberg's GT2 Post Hoc test was used. According to the results of the test, there is a significant difference between science courses teachers and basic education teachers (sig:.004<.05) and sport-art teachers (sig:.029<.05) in terms of technology knowledge. In addition, science courses teachers ($\bar{x}$=3.92) find themselves more competent than teachers in other specializations in terms of technology knowledge.

According to the study, there is a significant difference in Content Knowledge according to teachers' teaching specializations ($F_{(3-364)}$=2.89; sig:.035<.05). Since variances were homogenously distributed (sig:.076>.05) and the distribution in sampling groups was not equal, Hochberg's GT2 Post Hoc test was used. This test revealed a significant difference between science courses teachers and basic education teachers (sig:.022<.05) in terms of Content Knowledge. In addition, science courses teachers ($\bar{x}$ =4.35) find themselves more competent than other branch teachers in terms of content knowledge.

The results of the study revealed a significant difference in Technological Content Knowledge according to teachers' teaching specializations ($F_{(3-364)}$=4.94; sig:.002<.05). Since variances were not homogenously distributed (sig:.000<.05), Games-Howell Post Hoc test was used. According to the results of the test, there is a significant difference between science courses teachers and basic education teachers (sig:.016<.05). In addition, science courses teachers ($\bar{x}$ =4.04) find themselves more competent than the teachers of other specializations in terms of technological content knowledge.

A significant difference was also found in Pedagogical Content Knowledge according to teachers' teaching specializations ($F_{(3-362)=}$6.62; sig:.000<.05). Since variances were homogenously distributed (sig:.107>.05) and the distribution in sampling groups were not equal, Hochberg's GT2 Post Hoc test was used. The test showed a significant difference between science courses teachers (sig:.000<.05) and social science courses teachers (sig:.005<.05). In addition, science courses teachers ($\bar{x}$ =4.33) believe that they are more competent than the teachers of other specializations in terms of Pedagogical Content Knowledge.

There was a significant difference in Technological Pedagogical Content Knowledge according to teachers' teaching specializations ($F_{(3-364)=}$3.70; sig:.011<.05). LSD Post Hoc test was used since variances were homogenously distributed (sig:.438>.05). According to the results of the test, there is a significant difference between basic education teachers and social science courses teachers (sig:.013<.05) and science courses teachers (sig:.012<.05); also between sport-art teachers and social science courses teachers (sig:.031<.05) and science courses teachers (sig:.027<.05) in terms of Technological Pedagogical Content Knowledge. High mean scores for these specializations in other Post Hoc tests also support this finding too.

Findings Regarding "Age" Variable

One-way ANOVA was used to determine whether TPACK factors differ according to age variable. Table 6 below shows the results of the significant differences.

Table 6. ANOVA Results regarding teachers' TPACK and age variable

Factors	Age Range	Age Range	n	$\bar{X}$	ss	F	p
Technology Knowledge	40-49 years old		114	3.53	--	12.46	--
		<30	23	4.07	.146		.001
		30-39	194	3.87	.075		.000
		>50	33	3.37	.127		.787
	>50 years old		33	3.37	--	12.46	--
		<30	23	4.07	.174		.000
		30-39	194	3.87	.121		.000
Pedagogy Knowledge	>50 years old		33	3.83	--	5.26	--
		<30	23	4.14	.138		.138
		30-39	194	4.19	.096		.001
		40-49	114	4.06	.101		.137
Content Knowledge	>50 years old		33	4.00	--	4.02	--
		<30	23	4.41	.154		.046
		30-39	194	4.31	.107		.027
		40-49	114	4.18	.112		.538
Technological Content Knowledge	40-49 years old		114	3.80	--	4.73	--
		<30	23	4.11	.187		.139
		30-39	192	4.02	.146		.016
		>50	33	3.74	.153		.981
Pedagogical Content Knowledge	40-49 years old		114	4.07	--	6.49	--
		<30	23	4.31	.111		.138
		30-39	192	4.30	.069		.005
		>50	33	3.96	.145		.891
Technological Pedagogical Knowledge	>50 years old		33	3.67	--	7.46	--
		<30	23	4.25	.183		.014
		30-39	192	4.13	.161		.031
		40-49	114	3.95	.167		.350
Technological Pedagogical Content Knowledge	>50 years old		33	3.68	--	8.22	--
		<30	23	4.21	.178		.023
		30-39	192	4.14	.161		.033
		40-49	114	3.91	.168		.524

There is a significant difference in teachers' Technology Knowledge ($F_{(3-364)}$=12.46; sig:.000<.05) according to their ages. Since the variances were homogenously distributed (sig:.053>.05), Hochberg's GT2 Post Hoc test was done. According to the results of the test, there was a significant difference between the teachers in 40-49 age group and who are younger than 30 years old (sig:.001<.05) and those in 30-39 age group (sig:.000<.05); and between the teachers who are older than 50 years old and those who are younger than 30 years old (sig:.000<.05) and those in 30-39 age group (sig:.000<.05). The teachers who are younger than 30 years old ($\bar{X}$=4.07) believe that they are more competent than older teachers in terms of Technology Knowledge.

The study found a significant difference in teachers' Pedagogy Knowledge ($F_{(3-364)}$=5.26; sig:.001<.05) according to their ages. Since the variances were homogenously distributed (sig:.117>.05), Hochberg's GT2 Post Hoc test was done. The test revealed a significant difference between the teachers who are older than 50 years old and those who are in 30-39 age group (sig:.001<.05). As for Pedagogy Knowledge, the teachers who are in 30-39 age group ($\bar{X}$=4.19) believe that they are more competent than older teachers.

The results of the study revealed a significant difference in teachers' Content Knowledge ($F_{(3-364)}$=4.02; sig:.008<.05) according to their ages. Since the variances were homogenously distributed (sig:.480>.05), Hochberg's GT2 Post Hoc test was done. The results of the test showed a significant difference between the teachers who are older than 50 years old and those who are younger than 30 years old (sig:.046<.05) and in 30-39 age group (sig:.027<.05). As for Content Knowledge, the teachers who are younger than 30 years old ($\bar{X}$=4.41) believe that they are more competent than older teachers.

The results of the study also revealed a significant difference in teachers' Technological Content Knowledge ($F_{(3-362)}$=4.73; sig:.003<.05) according to their ages. Since the variances were not homogenously distributed (sig:.029>.05), Games-Howell Post Hoc test was done. According to the results of the test, there is a significant difference between the teachers who are in 40-49 age group and those in 30-39 age group (sig:.016<.05). As for Technological Content Knowledge, the teachers who are younger than 30 years old ($\bar{X}$=4.11) believe that they are more competent than older teachers.

There is also a significant difference in teachers' Pedagogical Content Knowledge ($F_{(3-362)}$=6.49; sig:.000<.05) according to their ages. Games-Howell Post Hoc test was done since the variances were not homogenously distributed (sig:.001<.05). Accordingly, there is a significant difference between the teachers who are in 40-49 age group and those in 30-39 age group (sig:.005<.05). The teachers who are younger than 30 years old ($\bar{X}$ =4.31) believe that they are more competent than older teachers in terms of Pedagogical Content Knowledge.

According to the results, there is a significant difference in teachers' Technological Pedagogical Knowledge ($F_{(3-362)}$=7.46; sig:.000<.05) in terms of their ages. Since the variances were not homogenously distributed (sig:.000<.05), Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between the teachers who are older than 50 years old and those who are younger than 30 years old (sig:.014<.05) and in 30-39 age group (sig:.031<.05). The teachers who are younger than 30 years old ($\bar{X}$ =4.25) believe that they are more competent than older teachers in terms of Technological Pedagogical Knowledge.

Finally, the study showed a significant difference in teachers' Technological Pedagogical Content Knowledge ($F_{(3-362)}$=8.22; sig:.000<.05) in terms of their ages. Since the variances were not homogenously distributed (sig:.000<.05), Games-Howell Post Hoc test was done and it revealed a significant difference between the teachers who are older than 50 years old and those who are younger than 30 years old (sig:.023<.05) and in 30-39 age group (sig:.033<.05). The teachers who are younger than 30 years old ($\bar{X}$=4.21) reported more competency than older teachers in terms of Technological Pedagogical Knowledge.

Findings Regarding "Types of Institution" Variable

One-way ANOVA was used to determine whether TPACK factors differ according to the type of educational institutions where the teachers worked; primary school, secondary school and high school. The results are displayed in Table 7.

Table 7. ANOVA Results regarding teachers' Technological Pedagogical Content Knowledge and types of institution variable

Factors	Variable	Variable	n	$\bar{X}$	ss	F	p
Technology Knowledge	High School		67	3.53	--	6.63	--
		Secondary School	202	3.84	.104		.011
		Primary School	95	3.64	.121		.622
Pedagogy Knowledge	Primary School		95	4.00	--	4.58	--
		Secondary School	202	4.19	.069		.025
		High School	67	4.05	.099		.860
Content Knowledge	Secondary School		202	4.33	--	4.88	--
		Primary School	95	4.15	.075		.045
		High School	67	4.13	.088		.071
Technological Content Knowledge	Secondary School		202	4.01	--	5.29	--
		Primary School	95	3.77	.085		.012
		High School	67	3.91	.082		.472
Pedagogical Content Knowledge	Secondary School		202	4.31	--	10.04	--
		Primary School	95	4.00	.075		.000
		High School	67	4.14	.080		.110
Technological Pedagogical Knowledge	Secondary School		200	4.13	--	4.99	--
		Primary School	95	3.94	.083		.067
		High School	67	3.90	.087		.030
Technological Pedagogical Content Knowledge	Secondary School		200	4.16	--	10.28	--
		Primary School	95	3.92	.075		.004
		High School	67	3.82	.085		.000

The result of the study showed a significant difference in teachers' Technology Knowledge ($F_{(3-364)}$=6.63; sig:.001<.05) in terms of their institutions. Games-Howell Post Hoc test was done since the variances were not homogenously distributed (sig:.000<.05). The results of the test revealed a significant difference between high school teachers and secondary school teachers (sig:.011<.05). The secondary school teachers ($\bar{X}$=3.84) believe that they are more competent than primary school and high school teachers in terms of Technology Knowledge.

According to the result of the study, there is a significant difference in teachers' Pedagogy Knowledge ($F_{(3-364)}$=4.58; sig:.011<.05) in terms of their institutions. Since the variances were not homogenously distributed (sig:.001<.05), and the distribution in sampling groups was not equal, Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between primary school teachers and secondary school teachers (sig:.025<.05). The secondary school teachers ($\bar{X}$=4.19) believe that they are more competent than primary school and high school teachers in terms of Pedagogy Knowledge.

According to the result of the study, there is a significant difference in teachers' Content Knowledge ($F_{(3-364)}$=4.88; sig:.008<.05) according to their institutions. Games-Howell Post Hoc test was done since the variances were not homogenously distributed (sig:.013<.05), and the distribution in sampling groups was not equal. According to the results of the test, there is a significant difference between primary school teachers and secondary school teachers (sig:.045<.05). The secondary school teachers ($\bar{X}$=4.33) believe that they are more competent than primary school and high school teachers in terms of Content Knowledge.

According to the result of the study, there is a significant difference in teachers' Technological Content Knowledge ($F_{(3-364)}$=5.29; sig:.005<.05) in terms of their institutions. Since the variances were not homogenously distributed (sig:.000<.05), and the distribution in sampling groups was not equal, Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between primary school teachers and secondary school teachers (sig:.012<.05). The secondary school teachers ($\bar{X}$=4.01) believe that they are more competent than primary school and high school teachers in terms of Content Knowledge.

The study also revealed a significant difference in teachers' Pedagogical Content Knowledge ($F_{(3-364)}$=10.04; sig:.000<.05) in terms of their institutions. Since the variances were not homogenously distributed (sig:.017<.05), and the distribution in sampling groups was not equal, Games-Howell Post Hoc test was done. The test showed a significant difference between primary school teachers and secondary school teachers (sig:.000<.05). The secondary school teachers ($\bar{X}$=4.31) believe that they are more competent than primary school and high school teachers in terms of Pedagogical Content Knowledge.

According to the results of the study, there is a significant difference in teachers' Technological Pedagogical Knowledge ($F_{(3-364)}$=4.99; sig:.007<.05) in terms of their institutions. Since the variances were not homogenously distributed (sig:.004<.05), and the distribution in sampling groups was not equal, Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between secondary school teachers and high school teachers (sig:.030<.05). The secondary school teachers ($\bar{X}$ =4.13) believe that they are more competent than primary school and high school teachers in terms of Technological Pedagogical Knowledge.

Finally, the results showed that there is a significant difference in teachers' Technological Pedagogical Content Knowledge ($F_{(3-364)}$=10.28; sig:.000<.05) in terms of their institutions. Since the variances were homogenously distributed (sig:.077>.05), Hochberg's GT2 Post Hoc test was done. The results of the test revealed a significant difference between secondary school teachers and primary school teachers (sig:.004<.05) and high school teachers (sig:.000<.05). The secondary school teachers ($\bar{X}$=4.16) believe that they are more competent than primary school and high school teachers in terms of Technological Pedagogical Content Knowledge.

Findings Regarding Technological Variables Affecting Teachers' Technological Pedagogical Content Knowledge

The study collected data about "teachers' access to technology in their schools", "their technology use" and "whether they have received any in-service training regarding technology use". The findings are presented below.

Findings Regarding "Access to Technology" Variable

A high percentage of teachers (%81.3) replied "Yes, I can" to the question "Can you access to technology you need in your school?" The differences for TPACK factors among teachers according to their access to technology were determined through t-test. The results showed that TPACK factors differ in terms of to what extent teachers can access to technology. The teachers who stated that they can access to technology they need in the school believed that they are competent in all TPACK factors: technology knowledge ($\bar{X}$ =3.78), pedagogy knowledge ($\bar{X}$ =4.16), content knowledge ($\bar{X}$ =4.30), technological content knowledge ($\bar{X}$ =3.99), pedagogical content knowledge ($\bar{X}$ =4.27), technological pedagogical knowledge ($\bar{X}$ =4.10) and technological pedagogical content knowledge ($\bar{X}$=4.09).

Findings Regarding "Technological Competencies" Variable

One-way ANOVA was used to determine whether TPACK factors differ according to teachers' technology use. The results are displayed in Table 8 below.

Table 8. ANOVA Results regarding teachers' Technological Pedagogical Content Knowledge and "Technological Competencies" variable

Factors	Variable	Variable	n	$\bar{X}$	ss	F	p
Technology Knowledge	Very good		44	4.60	--	107.32	--
		Good	183	3.85	.065		.000
		Medium	130	3.32	.072		.000
	Good	Medium			.059		.000
Pedagogy Knowledge	Very good		44	4.51	--	30.35	--
		Good	183	4.18	.076		.000
		Medium	130	3.92	.079		.000
	Good	Medium			.052		.000
Content Knowledge	Very good		44	4.60	--	32.51	--
		Good	183	4.37	.084		.017
		Medium	130	3.99	.087		.000
	Good	Medium			.057		.000
Technological Content Knowledge	Very Good		44	4.60	--	75.67	--
		Good	181	4.05	.060		.000
		Medium	130	3.57	.073		.000
	Good	Medium			.063		.000
Pedagogical Content Knowledge	Very good		44	4.57	--	34.04	--
		Good	181	4.31	.064		.000
		Medium	130	3.93	.077		.000
	Good	Medium			.063		.000
Technological Pedagogical Knowledge	Very good		44	4.62	--	64.25	--
		Good	181	4.18	.065		.000
		Medium	130	3.71	.073		.000
	Good	Medium			.060		.000
Technological Pedagogical Content Knowledge	Very good		44	4.60	--	46.82	--
		Good	181	4.13	.064		.000
		Medium	130	3.77	.075		.000
	Good	Medium			.063		.000

The study revealed a significant difference in teachers' Technology Knowledge ($F_{(3-357)}$=107.32; sig:.000<.05) in terms of their technological competencies. Since the variances were not homogenously distributed (sig:.023<.05), Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between the teachers who label their technological competencies as "very good" and those who label it as "good" (sig:.000<.05) and those who label it as "medium" (sig:.000<.05). The teachers who define themselves as very good technology users ($\bar{X}$=4.60) believe that they are more competent than those who define themselves as good ($\bar{X}$=3.85) and as medium ($\bar{X}$=3.32) in terms of Technology Knowledge.

According to the results of the study, there is a significant difference in teachers' Pedagogy Knowledge ($F_{(3-357)}$=30.35; sig:.000<.05) in terms of their technological competencies. Hochberg's GT2 Post Hoc test was done since the variances were homogenously distributed (sig:.023<.05), and the distribution in sampling groups was not equal. The results of the test revealed a significant difference between all groups. Accordingly, there is a significant difference between the teachers who label their technology use as "very good" and those who label it as "medium" (sig:.000<.05) and those who label it as "medium" (sig:.000<.05), and also between

those who define themselves as "good" and those who said that they are medium level technology users (sig:.000<.05). The teachers who define themselves as very good technology users ($\bar{X}$=4.51) believe that they are more competent than those who define as good ($\bar{X}$=4.18) and as medium ($\bar{X}$=3.92) in terms of Pedagogy Knowledge.

The study also showed a significant difference in teachers' Content Knowledge ($F_{(3-357)}$=32.51; sig:.000<.05) in terms of their technological competencies. Since the variances were homogenously distributed (sig:.229>.05), and the distribution in sampling groups was not equal, Hochberg's GT2 Post Hoc test was done. The results of the test revealed a significant difference between all groups. Accordingly, there is a significant difference between the teachers who label their technology use as "very good" and those who label it as "good" (sig:.017<.05) and "medium" (sig:.000<.05); and between those who define themselves as "good" level of technology users and those who said that they are "medium" level of technology users (sig:.000<.05). The teachers who define themselves as very good technology users ($\bar{X}$=4.60) believe that they are more competent than those who define as good ($\bar{X}$=4.37) and as medium ($\bar{X}$=3.99) in terms of Content Knowledge.

The findings of the study revealed a significant difference in teachers' Technological Content Knowledge ($F_{(3-355)}$=75.67; sig:.000<.05) in terms of their technological competencies. Games-Howell Post Hoc test was done since the variances were not homogenously distributed (sig:.000<.05). The results of the test revealed a significant difference between all groups. Accordingly, there is a significant difference between the teachers who label their technology use as "very good" and those who label it as "good" (sig:.000<.05) and "medium" (sig:.000<.05); and between those who define themselves as "medium" level of technology users (sig:.000<.05) and those who said that they are "good" technology users (sig:.000<.05). The teachers who define themselves as very good technology users ($\bar{X}$=4.60) believe that they are more competent than those who define as good ($\bar{X}$=4.05) and as medium ($\bar{X}$=3.57) in terms of Technological Content Knowledge.

The findings of the study also revealed a significant difference in teachers' Pedagogical Content Knowledge ($F_{(3-355)}$=34.04; sig:.000<.05) in terms of their technological competencies. Since the variances were not homogenously distributed (sig:.011<.05), Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between all groups. Accordingly, there is a significant difference between the teachers who label their technology use as "very good" and those who label it as "good" (sig:.000<.05) and "medium" (sig:.000<.05); and between those who define themselves as "good" level of technology users and those who said that they are "medium" technology users (sig:.000<.05). The teachers who define themselves as very good technology users ($\bar{X}$=4.57) believe that they are more competent than those who define as good ($\bar{X}$=4.31) and as medium ($\bar{X}$=3.93) in terms of Pedagogical Content Knowledge.

The study revealed a significant difference in teachers' Technological Pedagogical Knowledge ($F_{(3-355)}$=64.25; sig:.000<.05) in terms of their technology use. Since the variances were not homogenously distributed (sig:.015<.05), Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between all groups. Accordingly, there is a significant difference between the teachers who label their technology use as "very good" and those who label it as "good" (sig:.000<.05) and "medium" (sig:.000<.05); and between those who define themselves as "good" level of technology users and those who said that they are "medium" technology users (sig:.000<.05). The teachers who define themselves as very good technology users ($\bar{X}$=4.62) believe that they are more competent than those who define as good ($\bar{X}$=4.18) and as medium ($\bar{X}$=3.71) in terms of Technological Pedagogical Knowledge.

Finally, the findings of the study revealed a significant difference in teachers' Technological Pedagogical Content Knowledge ($F_{(3-355)}$=46.82; sig:.000<.05) in terms of their technology use. Since the variances were not homogenously distributed (sig:.003<.05), Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between all groups. Accordingly, there is a significant difference between the teachers who label their technology use as "very good" and those who label it as "good" (sig:.000<.05) and "medium" (sig:.000<.05); and between those who define themselves as "good" technology users (sig:.000<.05) and those who said that they are "medium" technology users (sig:.000<.05). The teachers who define themselves as very good technology users ($\bar{X}$=4.60) believe that they are more competent than those who define as good ($\bar{X}$=4.13) and as medium ($\bar{X}$=3.77) in terms of Technological Pedagogical Content Knowledge.

Findings Regarding "Receiving In-Service Training" Variable

%68.4 of the participants replied "yes" to the question "Have you received any in-service training about technology use?". The differences in TPACK factors according to the variable "receiving in-service training programs" were determined through t-test. The results showed that all factors differ for this variable. The teachers who have received in-service training programs stated that they found themselves competent all TPACK factors: technology knowledge ($\bar{X}$ =3.87), pedagogy knowledge ($\bar{X}$ =4.21), content knowledge ($\bar{X}$ =4.34), technological content knowledge ($\bar{X}$=4.09), pedagogical content knowledge ($\bar{X}$=4.32), technological pedagogical knowledge ($\bar{X}$=4.14) and technological pedagogical content knowledge ($\bar{X}$=4.12).

Findings Regarding "Educational Information Network (EIN) Use" Variable

One-way ANOVA was done to determine whether TPACK factors differ according to teachers' EIN use. Table 9 below shows the significant results.

Table 9. ANOVA results regarding teachers' TPACK and "EIN Use" variable

Factors	Variable	Variable	n	$\bar{X}$	ss	F	p
Technology Knowledge	Regularly		39	4.17	--	13.31	--
		When needed	309	3.70	.090		.000
		Never	16	3.26	.280		.012
Pedagogy Knowledge	Regularly		39	4.31	--	3.27	--
		When needed	309	4.09	.087		.033
		Never	16	4.08	.153		.354
Content Knowledge	Regularly		39	4.48	--	5.27	--
		When needed	309	4.23	.095		.026
		Never	16	3.98	.168		.009
Technological Content Knowledge	Regularly		39	4.24	--	5.61	--
		When needed	309	3.90	.104		.004
		Never	16	3.80	.181		.047
Pedagogical Content Knowledge	Regularly		38	4.43	--	4.17	--
		When needed	308	4.17	.097		.024
		Never	16	4.04	.168		.062
Technological Pedagogical Knowledge	Regularly		38	4.21	--	3.21	--
		When needed	308	4.03	.106		.251
		Never	16	3.75	.184		.039

The findings of the study revealed a significant difference in teachers' Technology Knowledge ($F_{(3-364)}$=13.31; sig:.000<.05) in terms of the frequency of EIN use. Since the variances were not homogenously distributed (sig:.000<.05), Games-Howell Post Hoc test was done. The results of the test revealed a significant difference between the teachers who regularly use EIN and those who use it when needed (sig:.000<.05) and those who never use it (sig:.012<.05). The teachers who regularly use EIN ($\bar{X}$=4.17) believe that they are more competent than those who use it when needed ($\bar{X}$=3.70) and those who never use it ($\bar{X}$=3.26) in terms of Technology Knowledge.

The study showed a significant difference in teachers' Pedagogy Knowledge ($F_{(3-364)}$=3.27; sig:.039<.05) in terms of the frequency of EIN use. Hochberg's GT2 Post Hoc test was done since the variances were homogenously distributed (sig:.066>.05), the distribution in sampling groups was not equal. The results of the test revealed a significant difference between the teachers who regularly use EIN and those who use

it when needed (sig:.033<.05). The teachers who regularly use EIN ($\bar{X}$=4.31) believe that they are more competent than those who use it when needed ($\bar{X}$=4.09) and those who never use it ($\bar{X}$=4.08) in terms of Pedagogical Knowledge.

According to the study, there is a significant difference in teachers' Content Knowledge ($F_{(3-364)}$=5.27; sig:.006<.05) in terms of the frequency of EIN use. Since the variances were homogenously distributed (sig:.094>.05) and the distribution in sampling groups was not equal, Hochberg's GT2 Post Hoc test was done. The results of the test revealed a significant difference between the teachers who regularly use EIN and those who use it when needed (sig:.026<.05) and those who never use it (sig:.009<.05). The teachers who regularly use EIN ($\bar{X}$=4.48) believe that they are more competent than those who use it when needed ($\bar{X}$=4.23) and those who never use it ($\bar{X}$=3.98) in terms of Content Knowledge.

The results of the study revealed a significant difference in teachers' Technological Content Knowledge ($F_{(3-364)}$=5.61; sig:.004<.05) in terms of the frequency of EIN use. Since the variances were homogenously distributed (sig:.226>.05) and the distribution in sampling groups was not equal, Hochberg's GT2 Post Hoc test was done. According to the results of the test, there is a significant difference between the teachers who regularly use EIN and those who use it when needed (sig:.004<.05) and those who never use it (sig:.047<.05). The teachers who regularly use EIN ($\bar{X}$=4.24) believe that they are more competent than those who use it when needed ($\bar{X}$=3.90) and those who never use it ($\bar{X}$=3.80) in terms of Technological Content Knowledge.

The study also showed a significant difference in teachers' Pedagogical Content Knowledge ($F_{(3-362)}$=4.17; sig:.016<.05) in terms of the frequency of educational information network use. Hochberg's GT2 Post Hoc test was done since the variances were homogenously distributed (sig:.075>.05) and the distribution in sampling groups was not equal. The results of the test showed a significant difference between the teachers who regularly use EIN and those who use it when needed (sig:.024<.05). The teachers who regularly use EIN ($\bar{X}$=4.43) believe that they are more competent than those who use it when needed ($\bar{X}$=4.17) and those who never use it ($\bar{X}$=4.04) in terms of Pedagogical Content Knowledge.

Finally, the results of the study revealed a significant difference in teachers' Technological Pedagogical Content Knowledge ($F_{(3-362)}$=3.21; sig:.041<.05) in terms of the frequency of EIN use. Since the variances were homogenously distributed (sig:.440>.05) and the distribution in sampling groups was not equal, Hochberg's GT2 Post Hoc test was done. The results of the test revealed a significant difference between the teachers who regularly use EIN and those who never use it (sig:.039<.05). The teachers who regularly use EIN ($\bar{X}$=4.21) believe that they are more competent than those who use it when needed ($\bar{X}$=4.03) and those who never use it ($\bar{X}$=3.75) in terms of Technological Pedagogical Content Knowledge.

DISCUSSION AND CONCLUSION

The study revealed that teachers find themselves competent in terms of TPACK factors. According to the means of TPACK sub factors, the teachers believed that they are competent the most in content knowledge ($\bar{X}$=4.25) and the least in technology knowledge ($\bar{X}$=3.74). The analyses of TPACK factors for demographic, technological and EIN use variable also revealed significant differences.

Age variable, which is a demographic factor, is significantly different only for technology knowledge. Male teachers believe that they have better technology knowledge than female ones, which implies that female teachers need more support for technology knowledge.

As for teaching specialization variable, significant differences were found between science courses teachers, basic education and sports-arts teachers. Because of low mean scores of basic education and sports-arts teachers for TPACK factors when compared to social science courses and science courses teachers, the first group teachers should be supported so that they can develop technological competencies.

As for "age" variable, we can conclude that the teachers who are older than 50 years old differ in TPACK factors more than younger teachers. Especially, the teachers who are 40 years old and above differ when compared to younger teachers in terms of technology knowledge. The teachers who are in 40-49 age group and older than 50 years old had lower means in all TPACK factors than younger teachers, which implies that in-service training programs should be implemented to develop technological competencies of older age groups.

As for the grouping of teachers according to educational institution type, the study found significant differences between secondary school teachers and primary and high school teachers in TPACK factors. The secondary school teachers had higher means than other groups of teachers in all TPACK factors and this finding should be examined in more detail in further studies.

The comparison of the statements related to technology with TPACK factors showed that the teachers' access to technology differed in all TPACK factors. The teachers who stated that they can access to technology in their schools believe that they are more competent in TPACK factors than those who stated that they cannot. The teachers who are interested in technology are more likely to develop quality teaching materials, learn about pedagogies suitable for new environments and improve their competencies in all TPACK fields. The findings which support this finding is that there are significant differences between the means of teachers who define their technology use as "medium" "good" and "very good" in terms of TPACK factors. As technology use level increases, TPACK competencies increase. This finding shows that improvement of teachers in terms of pedagogy and content should be based on and integrated with technology use. Another item in the study was whether "the teachers have received any in-service training about technology use or not". The responses provided for this item showed that those who have received this kind of in-service training significantly differed from those who have not in terms of all TPACK factors and had higher means, which indicates higher TPACK competencies.

The frequency of teachers' EIN use was classified as "never" "when needed" and "regularly". When this classification was examined in relation to TPACK factors, it was found that there was a significant difference between the teachers who use EIN regularly and those who use it when needed and those who never use it in terms of the following TPACK factors: Technology Knowledge, Content Knowledge, and Technological Content Knowledge. Similarly, the teachers who are regular users of EIN significantly differ from those who use it when needed in Pedagogy Knowledge and Pedagogical Content Knowledge. Accordingly, we can conclude that technology knowledge is a determining factor in EIN use. Indeed, the regular users of EIN had higher means scores for all TPACK factors, which implies that they find themselves more competent than others.

Finally, this study revealed that "access to technology", "technology use level" and "receiving in-service training about technology" have significant effects on TPACK factors. The teachers who find themselves competent in technology also find themselves competent in terms of technology, content, pedagogy, technological content, technological pedagogical and technological pedagogical content. Accordingly, increasing teachers' competencies in above mentioned issues will have positive effects on their content and pedagogy knowledge and contribute to their development by combining their technology, content and pedagogy knowledge. Consequently, distance and technology-based educational environments such as EIN will be more effective, and more people will benefit from these new educational environments in the future.

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EFFICIENCY OF BIOMETRIC RECOGNITION TECHNOLOGY BASED ON TYPING DYNAMICS IN MOOC

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Received: 10/07/2019 **Accepted:** 10/06/2020

ABSTRACT

One of the problems that require a solution in Massive Open Online Courses (MOOC) is the lack of identification and authentication of the students. Different investigations have been carried out through several navigation, physiological and behavioral methods, achieving different recognition scales. Biometric authentication by keystroke patterns (Ups&Downs) has been implemented in several MOOCs for the ease of the digital platforms of the offeror to solve the identification problem. The objective of this research is to analyze the independence of the keystroke tool of the other demographic, sociographic and behavioral variables within a MOOC, establishing an initial pattern, and two authentication measurements throughout the course. The results show that the keystroke is independent of the analyzed variables, and it is reliable to identify the students in qualitative tests with extension answers.

Keywords: Biometrics, identification, MOOC, pulsations

INTRODUCTION

Digital technology applied in education has changed teaching and learning methods. Its growth has been accelerated in the last decade and has managed to optimize variables such as time, location, content, interaction, and communication. The accessibility of digital platforms allows the integration of students of different age ranges, educational levels, motivations towards achievement and socio-cultural characteristics. Within this context, the Massive Online Open Course (MOOC) trend has become a learning model of the future allowing asynchronously relating two learning factors such as the teacher and the student. The MOOCs optimize variables such as: tuition costs, time availability, previous requirements, student coverage and flexibility (Gutl, Rizzardini, Chang & Morales, 2014; Zambrano, Cano & Presiga, 2017). Through MOOCs, universities and global institutions are responsible for offering and promoting courses so that people can access without restriction, creating opportunities to democratize education (Fernandez-Ferrer, 2017).

Vilar et al. (2013) affirm that the information and communication technology (ICT) has triggered innovation processes in online education and dizzying changes driven by the demands of the Information Society and increasingly globalized work contexts, which focus on the modernization of processes training of future professionals. Franco-Casamitjana (2005); Franco-Casamitjana, et al., 2013 also confirm that the strategies that educational institutions use to bring knowledge closer to citizens will determine the limits of future

learning networks. This education and continuous training have always been tools for the creation of wealth, and nowadays, in societies based on the information and technology economy, these factors acquire greater importance. Some experts predict that MOOCs will mutate into new forms that have a greater emphasis on the accompaniment of learning, so that progressively there will be a decrease in the number of participants and better accompaniment. Assessment systems will be implemented that guarantee the acquisition of competences and not only knowledge, and quality criteria will be established that do not limit themselves to issuing an assessment based on the "reputation" of the educational institution that offers the course, its terminal efficiency and / or dropout rate (Menendez, 2013).

The quality of a MOOC is a fundamental aspect that must be taken into account in the design and delivery; it is a key question if it is intended to offer through MOOCs, valuable learning experiences that can be sustainable in the long term. Therefore, the institutional quality audit has to contribute to the promotion of a high quality improvement in teaching and learning (EFQUEL, 2013). MOOCs must apply the same quality requirements that training courses offered online and at distance apply. The application of these quality criteria would provide an educational guarantee, provided that these indicators do not operate in isolation and are articulated in an appropriate way to have a comprehensive image of the reference educational system (Bernal et al., 2013). AlemAn de la Garza, Sancho and Gomez Zermeno (2015) corroborate that the fact that MOOCs are massive, online and open courses, requires greater rigor in the control of their quality, since these courses are aimed at different profiles, without much control of its results and achievement of its objectives. For this reason, the construction of identity verification tools should also strengthen quality in the key processes of a MOOC: planning, design, development and implementation.

However, the disadvantages of the MOOC question the recognition of the identity of the student, to certify that the person receiving the learning and performing the evaluations is who claims to be (Sanna & Marciales, 2017). In this regard, the use of digital technology has allowed automate and improve these processes of biometric recognition, so that they have many applications and purposes, especially those related to security. Biometrics is a method of recognizing people based on their physiological or behavioral characteristics. It is a process similar to that usually performed by human beings recognizing and identifying their congeners by their physical appearance, their voice, their way of walking, among others. Biometric technologies are defined as automatic methods used to recognize people based on the analysis of their physical or behavioral characteristics. Depending on the biometric technique used, the parameters considered are different: grooves of the fingerprint, the geometry of the hand, voice, and facial image. From these parameters, a unique personal pattern is extracted, which will be the one used for later comparisons (Tapiador, 2005; INCIBE, 2016).

Types of Biometric Technologies

Learning management systems offer tools based on biometric technologies, which are usually applied in two phases: registration and authentication. Similarly, there are three modes used for the authentication of a person: physical element, knowledge of secret information, and biometrics. The physical element refers to the position of a key, smart card or digital passport. The knowledge of secret information is composed of an alphabetic, numeric or mixed password. Biometrics measures unique human characteristics or traits (Ali, Monaco, Tappert & Qiu, 2015). In the case of MOOCs, it is not only necessary to identify the student at the time of registration, but also in the development of the course, especially when making qualitative answers. There are different technologies for the administration and identification of students of a MOOC.

Currently, biometric technologies are applied in three different areas: (a) Learning management system (LMS), (b) Mobile applications and (c) proprietary software. LMS (Learning Management System) focuses on the management of students, experiences during learning, and optimizes the time to create and distribute the courses with participants. Mobile applications allow students to manage and profile through different mobile systems such as tablets and smartphones. The proprietary software is developed by the course providers to create their learning platform and allows the inclusion of private biometric identification tools. The three student management technologies require to know with certainty that the students really did the academic tasks with qualitative answers assigned and that the selected tool achieves the objective of identification independently of the demographic characteristics of the students, technological tools of interrelation and that has sufficient reliability within the operating environment (Fenu, Marras & Boratto, 2017).

The biometric characteristics consider three features: physiological (retina, iris, facial or hand geometry), navigation (touch and mouse movements) and behavioral (signature, voice and dynamics in the keystrokes when writing) (Fenu, Marras & Boratto, 2017). These characteristics are difficult to reproduce and cannot be lost or forgotten. Monaco, Stewart, Cha and Tapper (2013) have studied identification through facial recognition; the results indicate that they were able to identify the students in real time, at low process costs and with a high degree of confidence. The characteristic of the voice was used to identify the presence of other subjects with the student while doing the learning or evaluative activity (Roth, Liu, Ross & Metaxas, 2013). Based on the dynamics of the keystroke, Monaco et al., (2013) incorporated the concept of stylometry, as linguistic characteristics that depend only on the syntax and hermeneutics of each subject.

Biometric Verification by Pulsations

Based on Monrose and Rubin (2000), the identification through the keystrokes, focuses on the student's writing style, contrasting a habitual typographic rhythm pattern, through one or more subsequent monitoring. Within the pulsations, two identification techniques are evident: static and continuous. The static technique makes the study within a certain time interval, and the continuous technique is carried out during the interaction. The continuous technique allows involving variables such as fatigue and attention, which normally appear within the process of student interaction. According to Deutshmann and Lindholm (2013) the continuous authentication systems consist of four parts: (1) Compilation of behavioral data gathered from the use of the mouse to the keyboard data (2) Classification of writing features, in different categories such as Ups and Downs, as their rate of change (3) Storage of the user profile and (4) Verification evaluation between the master profile and the digital behavior. In general, tactile capture algorithms include different gross gestures (time, manipulation, vibration, rotation, pressure, touch size and position) (Fenu, Marras & Boratto, 2017; Hernandez-Ortega et al., 2020).

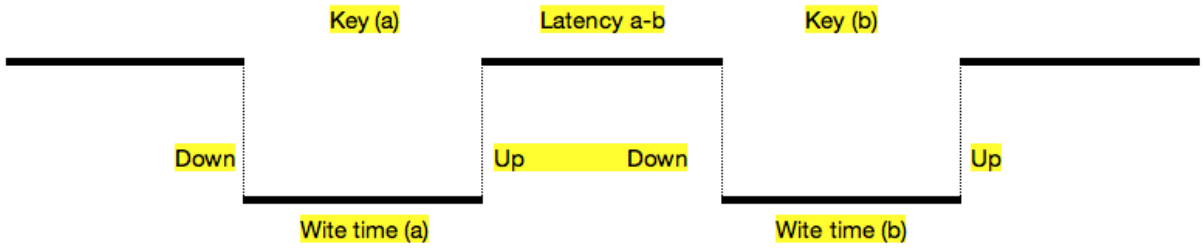

Figure 1. Biometric recognition technology based on the typing dynamics exposed by Morales, Fierrez,Vera-Rodriguez and Ortega-Garcia (2015)

The main objective of this work is to know if the biometric measure, pressure, rise, and change between letters is independent of the variables presented in a digital course or is influenced by characteristics of the students and the experiences that a selected MOOC presents. To achieve the objectives of this research, was used the biometric recognition technology based on the typing dynamics exposed by Morales, Fierrez,Vera-Rodriguez and Ortega-Garcia (2015) (Figure 1). This keystroke dynamics technology analyzes and models the waiting time or time of pressing and releasing a key and the time of elevation or difference between the type of key pressed and the time of elevation of the previous key, through a sequence according to the number of characters the words have. Finally, a unique vector is determined for each individual that is related to the identity of the subject, this vector is stored as a template to be compared later between the moment of registration and the moment of evaluative cuts.

METHOD

In a world that generates large amounts of data, the mathematics applied in its analysis can replace some traditional research instruments. For Siemens (2011), education brings together a surprising variety of quantitative data in teaching-learning processes, which have been little used. For this reason, online

education institutions have recently begun to study how to apply data analytics to understand and design new metrics to assess learning (Aleman de la Garza, 2019; Aleman de la Garza y Gomez Zermeno, 2019).

Cross (2013) reports that MOOC research generates new methodological and interpretive challenges. It warns of the difficulty of adequately coding and analyzing a large amount of information from disparate sources to determine how and on what terms the success of a course is valued. This type of analysis can be complicated, because the public is massive and heterogeneous, the particular uses, and the articulations of technologies with pedagogy in a MOOC context, still need to be tested with appropriate instruments (AlemAn, 2019, VelAzquez Sortino, et al., 2017).

This research presents a transactional and longitudinal quantitative analysis based on students of a MOOC during the first semester of 2018. Two stages were conducted: Stage 1, Descriptivo, Stage 2, Relational and Stage 3, Predictive. Confirmation of the identification of the subject was chosen as a dependent variable during two moments. The analyzes were performed with the IBM SPSS Statistics program version 25. To examine the results and find the independence of the Software regarding the way students are identified based on their writing profile, the independent variables used were: gender, age, educational level, amount of data lost at the time of registration, interest for the certificate, participation in the forum, participation in peer evaluation, enrollment status and identification of the subject at the time of registration.

Participants

The population analyzed corresponds to the participants of a MOOC focused on Electrical Engineering (N=4.232). Those students under the age of 18 who preferred to perform the MOOC at their own pace were excluded from the study (outside of the stipulated dates for the planned activities), resulting 4.060 participants. The lost data of the participants at the time of registering presents an M=2.55 and SD= .67, failing to report their complete information. 85.5% of the participants were Mexican and the rest from different parts of the world in small proportions (Table 1).

Table 1. Demographic information of those registered in all MOOCs

Gender	Female (23.6%), Male (76.2%)
Level of schooling (years)	8(0.1%),10 (41.1%), 12 (22.4%), 14 (5.5%),16 (19 %), 18 (1%), 22 (8.5%), Lost (0.3%), others (2.1%).
Rangos de edad	18 a 28 (54.9%), 28 a 38 (23.2%), 38 a 48 (11.3%), 49 a 58 (5.1%), 58 a 68 (1.3%), >68 (0.2%), sin reportar (4.1%).

Instruments

The students were recruited through digital advertising for a period of two months. The cost of the certificate was 50 USD and the duration of the course was five weeks. The students knew a unique start date, after which no other student could be linked. The MOOC used the Keytrack biometric identification software, which measured the agreement between the initial pattern (form b) and the measurements in percentages (form d). The analysis protocol followed three phases: (1) Registration, each student at the time of registration answered the question: What are the expectations you have about the course? This question served as a biometric pattern and did not the present time or character limits. (2) First-grade assessment, once week three arrived, students were presented with a qualitative question about the course material of block three. (3) Second-level assessment, at the end of the last week of the course, the students answered in an extensive way, a question about block five of the course. Both in the evaluation, a and b, the returns of the questions were recorded and contrasted against the pattern of phase one, to determine the concordance between the Ups and Downs on the keyboard, and the speeds between letters.

Data Collection and Analysis

The data collection was done through four forms: (a) Registration form with the demographic characteristics of the students (gender, age, country, and educational level); (b) Initial Comment Form, which presented the different interests of the participants in carrying out the course qualitatively; (c) Interest to obtain the Certificate form, which contained the question about whether they wanted to buy the course approval diploma digitally; (d) Evaluation form for qualitative questions for biometric authentication. This form was applied in two different weeks of the MOOC. The use of the keyboard was mechanical, and in the case of laptops, their one was used.

FINDINGS

The analyses were carried out according to the stages and estimated phases and sought to provide an answer: (a) the percentages of identification in the first and second measurements, (b) the independence of biometrics recognition of independent variables and (c) the relationship between the two recognitions. For Stage 1, descriptive, recognition (a), had a participation of 225 students (M=91.84, DS=23.83) and the software identified the pattern with the answers in 89.8% with a coincidence between 80-100%. For recognition (b), 231 responses were received (M=89.24, DS=24.95) and the software results were consistent with the initial pattern at 87%, with a coincidence between the range 80-100% (Figure 2).

Within the development of Stage 2, Relational, the possible association between the independent variables (gender, educational level, age range, amount of data lost at the time of registration, participation in the forum, participation in peer evaluation and certificate eligibility) was analyzed with the recognition (a) and (b); to identify if any variable had an impact on the identification, or on the opposite, to know if the recognition of the student identity only depended on the comparison with the initial patterns. The results indicate that the recognitions (a) and (b) are independent of the selected variables (Table 2). Likewise, the week of student abandonment is not associated with biometric recognition, for the first identification F (20, N = 224)=1.54, p=0.1 and for the second F(20,N = 230)=0.76, p=0.5.

Finally, the relationship between the two established biometric recognition was analyzed; were found associations between the identification percentage (80-100%) of the instant one with the identification percentage (80-100%) of the instant two; F (5, N = 178) = 1.40, p = 0.16. The above values indicate that the same subjects were identified within a high range of identification in the two measurements, that their identification was not random and that the passage of time or experiences within the space of the measurements are not related; on the contrary, they are independent.

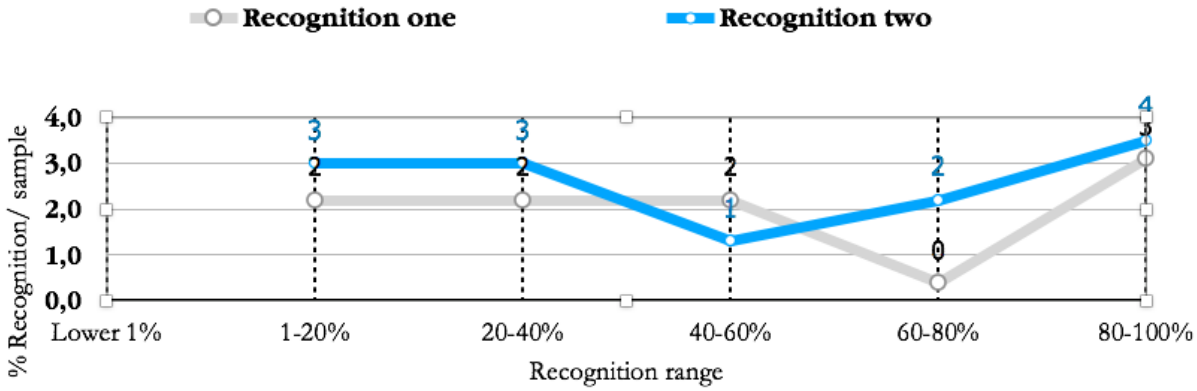

Figure 2. Percentage of recognition by sampling

Table 2. Independence of recognition of student identity

Independent variable	Value of the test	
	Recognition 1	Recognition 2
Gender	χ2 (4, N = 224) = 3.25, p=0.6	χ2 (4, N = 230) = 2.94, p=0.7
Educational level	χ2 (30, N = 225) = 28.97, p=0.7	χ2 (30, N = 231) = 27.79, p=0.8
Lost data	F(5,N = 225)=0.50, p=0.7	F(5,N = 225)=0.25, p=0.9
Participacion foro	χ2 (5, N = 224) = 2.88, p=0.7	χ2 (5, N = 231) = 4.58, p=0.4
Rango de edad	χ2 (20, N = 224) = 18.66, p=0.5	χ2 (20, N = 231) =0.82, p=0.7
Elegible para certificado	χ2 (4, N = 224) = 3.25, p=0.6	χ2 (4, N = 224) = 3.25, p=0.6

Source: *Author's compilation. % Recognition (1) week three and (2) week five.*

Within the development of Stage 3, Predictive, the results of the binary logistic regression in block zero indicate that the probability of successful recognition of the subjects in a second measurement with a percentage greater than 60% is 97.3. For block 1 of the model, the ROA statistical efficiency score indicates that there is a significant improvement in the occurrence of the categories of the dependent variable (χ2 (1, N = 224) = 33.49, p <.001) if a predictor variable. The Naglekerke coefficient of R squared; shows that the proposed model explains 75.4% of the variance of the dependent variable when the subject identification variable is added at the time of enrollment. For the final analysis of the regression, block 1 indicates that there is a 99.5% probability of correctness in the result of the identification of the subject in the final stage, when the software has identified the subjects in the first measurement; indicating that the software has an identification improvement capacity. The Wald score for the tested model shows that the independent variable (first measure) contributes significantly to the prediction of the dependent variable (second measure) Wald (1, N = 224) = .0, p <.001) and the results obtained from this model can be generalized to the population.

DISCUSSIONS AND CONCLUSION

This document explored the efficiency of the pulse identification tool in a MOOC. The results indicate that the Keytrack tool identified the participants in two different measurements between 80-100%. The identifications were made in authentication scenarios independent of the text and in a multiple session environment such as that carried out by Morales, Fierrez, Vera-Rodriguez and Ortega-Garcia (2015). The identification in weeks three and four were autonomous in relation to the variables: gender, educational level, lost data, interest in the certificate, week of student desertion and age range; confirming the independent capacity of the algorithm in terms of measuring Ups and Downs and providing a human trait which is typing on the computer. This human trait is consistent with the line of research by. The work also showed that the two recognitions were related to each other with an average association, and the same subjects identified in the first measurement were identified in the last one. It is interesting to describe that regardless of the number of characters per words, the percentage of identification remains with low variation. These results allow establishing that the method and the biometric verification by pulsations (Keytrack), provides enough evidence to confirm the identification of students who take online programs.

The results obtained in this research are consistent with the results of Monrose & Rubin (2000). The Keytrack tool was able to identify each student using the writing style and find a unique pattern according to the typographic rhythm. The tool used to classify the students' writings into different categories of Ups and Downs (Deutshmann & Lindholm, 2013; Morales, Fierrez, Vera-Rodriguez & Ortega-Garcia, 2015). On the other hand, a special contribution of this work is to show the learning capacity of the tool, after having been able to register and identify a student in a preliminary measure. In conclusion, the first identification of the subjects, allows predicting the final identification of the subject and explains it in 75.4%; There is a 99.5% probability of correct identification of a subject, if a first identification is made and there are very few additional variables to improve the final prediction. The high probability of identification found in this study exceeded the biometric recognition rate per click estimated by Morales et al., (2015) which was

9.05%. Likewise, the Keytrack tool was more efficient in identifying participants with 23 words on average per response, in contrast to the 500 words used in the Morales et al. (2015). If individuals are identified the first time, they are more likely to identify them with a higher probability of success in a second measurement; however, when the subjects do not participate in the second measurement, the probability of identification remains high at 97.3%.

In future works, it would be interesting to expand the study of the identification tools, in different topics of MOOCs with different degrees of difficulty and to estimate whether the emotions that the students present when answering the evaluation questionnaires affect the writing rhythm. Furthermore, it may be pertinent to evaluate the effect of the identification tool on other types of devices such as tablets and cell phones; to generate a comparison with the keyboards of the computers. These analyzes can help the student identification process, increasing confidence, the use of open-ended questions and reducing review times by teachers. Finally, the identification tool could also be used from the moment the student enters the platform with their password and thus have a mandatory initial registration as the first measure to complete the identification pattern. This information may be useful for application in other MOOC activities, such as participating in discussion forums.

Achnowledgements: This work was partially supported by TEC- Monterrey Mexico

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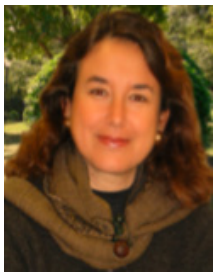

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INVESTIGATING STUDENT SATISFACTION IN ONLINE LEARNING: THE ROLE OF STUDENT INTERACTION AND ENGAGEMENT IN DISTANCE LEARNING UNIVERSITY

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Received: 05/09/2019 **Accepted:** 12/06/2020

ABSTRACT

This study aimed to analyze student satisfaction and engagement effect in online learning which are influenced by student interaction. We use the concept of interaction which is divided into three types of interactions, namely student interactions with other students, student interactions with tutors/teachers, and student interactions with content. We conducted this research in an open and distance learning university in Indonesia. To answer the research goals, we applied a quantitative research approach utilizing structural equation modelling to verify our proposed hypotheses. To gain the data, we exploit an online survey through a questionnaire and the data were being collected randomly. The population of this study was all students in Faculty of Economics who registered in online learning at the first semester of 2018 that reach as many as 124,041 students. We attached the questionnaires in all online classes and 4,305 of them were completed and could be used for statistical analysis. We proposed four hypotheses and based on the result of structural modelling, we verified that all the hypotheses were supported. The statistical analysis has found that interaction among students, interaction between students and teacher, and interaction between students and content have positive impact on student engagement. The results also showed that student engagement has positive impact on student satisfaction. We discuss the practical implication and suggestion for future research in the results and discussion section.

Keywords: Interaction, online learning, student engagement, student satisfaction

INTRODUCTION

Many studies in online learning area have widely expressed the importance of student satisfaction as it associates to student success in learning. Several previous empirical studies have verified the existence of various variables that influence student satisfaction. Furthermore, interaction tends to become an important topic in many researches that affect student satisfaction in online learning (Mandernach, 2005). This

interaction can occur among students, between students and their teachers/tutors, and between students and course content. Likewise, student engagement also plays an important role for student success in an online environment. However, we found that there is limited studies investigating the influence of student engagement on student satisfaction. The importance of student engagement in online learning has confirmed due the thought that it can be demonstrated through cognitive development of student and their ability to construct knowledge in order to drive their successful in learning (Banna et al., 2015). However, it is contrary to the fact that student tends to have fewer opportunities to be engaged with the institution in online environment (Martin & Bolliger, 2018). According to this condition, creating student engagement becomes an important point for managing online learning to attain student satisfaction. Furthermore, it is also important to explore how engagement is constructed by interaction in online learning.

Student satisfaction becomes an important topic in Open and Distance Learning (ODL) practice, including in our university. In recent years, we have experienced a decline in the number of our students as stated by Sembiring (2017). Since 2011 until 2015, the number of our students are 446,326; 415,030; 353,193; 333,501; and 309,508 students. We estimate, that there will be a decline in the number of students in next years. However, in our strategic plan, we already established that the number of our students is expected not less than 250,000 students to sustain our existence (Universitas Terbuka, 2014). Realizing how crucial this issue for us, it is reasonable to explore how to attain student satisfaction in our learning activities.

The purpose of present study was to investigate the influence of student engagement on student satisfaction, where engagement is determined by interaction. We emphasize on student satisfaction in learning process due the condition, that nowadays, we offer online learning for all subjects. Therefore, the main purpose of present research are (1) to investigate the influence of interaction on student engagement, and (2) to investigate the influence of student engagement on student satisfaction. We analyzed the interaction in online learning based on the interaction among students, interaction between student and tutor, and interaction between student and course content.

LITERATURE REVIEW

In a various literature and previous research, engagement and interaction are closely associated in online learning. The importance of student engagement in online learning has stated by Martin & Bolliger (2018). Anderson (2003) has found that interaction can create student engagement, and furthermore, interaction is also found as an essential topic related to student success in online learning. Student success become critical in online environment since online environment encourage students to depend mostly on their ability to learn. Verneil & Berge (2000) has shown that student success in online learning mostly supported by their activity during learning process. Blasco-Arcas et al. (2013) stated that there are two factors that are directly associated to active learning, those are interactions and engagement. Wang & Baker (2015) stated that student engagement is student effort to get involve in learning processes of a specific course. It is also become one of important variable in conducting online learning effectively (Dixson, 2010).

In an online environment, there are three types of interaction in engagement as proposed by Bernard et al. (2009), those are interaction between students, interaction of student to instructor, and interaction of student to content. Lear et al. (2010) who has proven that those types of interaction can help students to be more active and more engaged in their learning support this concept. Being consistent with that opinion, Martin & Bolliger (2018) also confirmed that engagement is critical to student learning and student satisfaction in their learning process, therefore student engagement can increase student satisfaction.

CONCEPTUAL FRAMEWORK AND HYPOTHESES

We propose the topic of this study is important in the context of distance education system that student satisfaction in online learning becomes an important aspect. The underlying reason is that the success of students in online learning is greatly influenced by student satisfaction, thus will lead them to complete their studies. In our university, as it is implementing open and distance education, we have a policy to give students flexibility during their learning process, including flexibility for students to register in the next semester. This system encourage us to focus on the effort to satisfy our students so that we can keep them

registered untill they graduate. Considering the goal of our organization and also several related literature and previous researches, we proposed conceptual framework as presented in Figure 1.

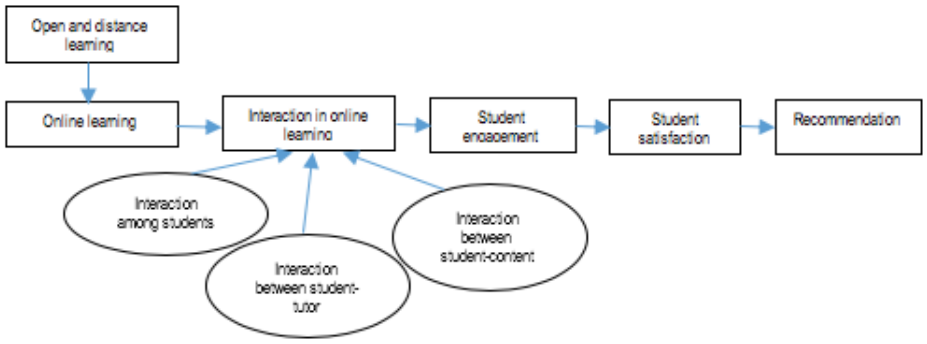

Figure 1. Conceptual framework

According to related literature and previous research, we propose four hypotheses as follows:

H1: Interaction of student to student has a positive effect on student engagement

H2: Interaction of students to tutor/teacher has a positive effect on student engagement

H3: Interaction of students to course content has a positive effect on student engagement

H4: Student engagement has a positive effect on student satisfaction

METHODOLOGY

Research Instruments

As mentioned previously, this study aimed to investigate student satisfaction in online learning through student engagement and interaction. Thus, there were five variables that we employed in the present study. The variables consist of three exogenous variables, those are interaction of students to other students, interaction of students to tutor, and interaction of student to course content; and two endogenous variables, those are student engagement and student satisfaction. As we design this study as confirmatory study, we developed the variables and hypotheses based on previous researches. Thus, the questionnaire was also developed based on previous researches with some adjustments to our condition. Table 1 shows references of each research variable. A 5-point Likert scale was utilized to measure respondent's response on each question with the range from 1 (strongly disagree) until 5 (strongly agree).

Table 1. References of the Research Variables

Variable	References
Interaction students and students	Johnson et al. (2000)
Interaction student and tutor	Peltier et al. (2003), Johnson et al. (2000)
Interaction student and course content	Peltier et al. (2003), Bernard et al. (2009)
Student engagement	Gray & DiLoreto (2016)
Student satisfaction	Gray & DiLoreto (2016)

Participants

This research is conducted based on the importance of online learning in ODL institution. More specifically, it focused on the online learning of the Faculty of Economics. To answer the research objectives, we need primary data in the form of opinions from students who take online learning. Therefore, the population of this study was all students in Faculty of Economics who registered in online learning at the first semester of 2018 that reach as many as 124,041 students. Simple random sampling was chosen as the most appropriate sampling technique to obtain data from the participants. As many as 4,305 students responded to the survey.

Data Collection

After developing the instrument, we sent the instrument in the form of a questionnaire to all online tutorial classes. The instrument was created in the form of an online questionnaire that made it easy for students to answer and automatically sent back the answers to us. The consideration of selecting an online questionnaire is that it made us easier to collect the answers as they are recapitulated directly by the system.

Data Analysis

To verify the research hypotheses, we applied structural equation modelling. However, before testing the hypotheses, we tested the research variables and indicators. The reliability of research variable was tested using Cronbach's Alpha while the validity test of indicator was performed using confirmatory factor analysis.

FINDINGS

The collected data was then analyzed to test the proposed hypotheses. However, as mentioned earlier, before conducting a hypothesis test to determine the effect among variables, we must ensure that all indicators have met validity requirements and all variables have met reliability requirements as well. Having this reason, a validity test and a reliability test are performed first. These tests are needed to ensure that indicators and variables in this study are feasible to serve as input to test the hypotheses. The reliability test was carried out using Cronbach's Alpha with criteria a variable which has reliability estimate of .7 or higher suggests as a variable with good reliability (Hair et al., 2014). After conducting a reliability test, we then conducted a validity test using confirmatory factor analysis with standardized loading estimate of each indicator should be .5 or higher (Hair et al., 2014). After the reliability and validity tests have been carried out, the final step was to conduct a structural model test to verify the effect among variables.

The reliability test results showed that all variables were statistically confirmed to have the requirements as reliable variables as verified by the results of the Cronbach's Alpha based on standardizes items are higher than .6 as presented in Table 2.

Table 2. Reliability test

Variable	Cronbach's Alpha based on standardized item	Remark
Interaction among students	.923	Reliable
Interaction between student-tutor	.928	Reliable
Interaction between student-content	.878	Reliable
Student engagement	.876	Reliable
Student satisfaction	.930	Reliable

The next step was to test the validity of indicators through confirmatory factor analysis and also the influence of variables as presented in Figure 2. The figure shows that all indicators in each variable are valid as verified by all the estimated values of the indicators are higher than .5.

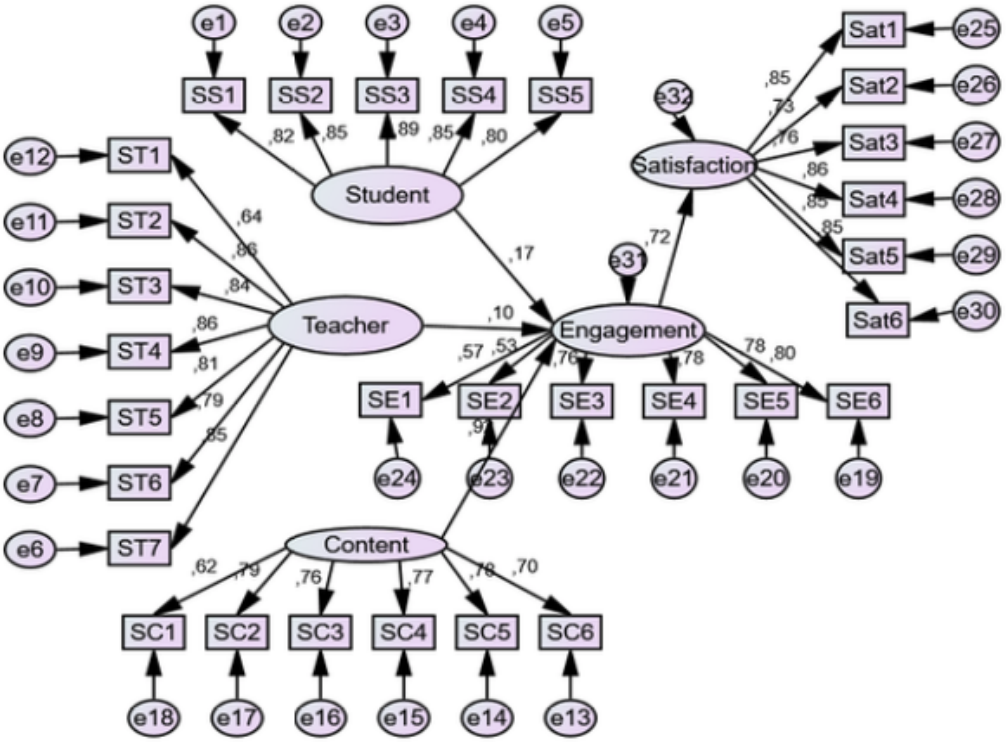

Figure 2. Structural Modelling

The result of validity test is presented in Table 3.

Table 3. Validity result

Variable	Indicator	Estimate	Remark
Interaction among students	SS1	.82	Valid
	SS2	.85	Valid
	SS3	.89	Valid
	SS4	.85	Valid
	SS5	.80	Valid
Interaction between student- tutor/teacher	ST1	.64	Valid
	ST2	.86	Valid
	ST3	.84	Valid
	ST4	.86	Valid
	ST5	.81	Valid
	ST6	.79	Valid
	ST7	.85	Valid
Interaction between student-content	SC1	.62	Valid
	SC2	.79	Valid
	SC3	.76	Valid
	SC4	.77	Valid
	SC5	.78	Valid
	SC6	.70	Valid
Student engagement	SE1	.57	Valid
	SE2	.53	Valid
	SE3	.76	Valid
	SE4	.78	Valid
	SE5	.78	Valid
	SE6	.80	Valid
Student satisfaction	Ssat1	.85	Valid
	Ssat2	.73	Valid
	Ssat3	.76	Valid
	Ssat4	.86	Valid
	Ssat5	.85	Valid
	Ssat6	.85	Valid

After conducting the validity test, the next step was to test the structural model. First, we tested the goodness-of-fit models to verify the accuracy of the model. According to our hypotheses, the result indicated that our model is acceptable as model that meet the criteria of goodness-of-fit model. The result showed that CFI, RMSEA, and NFI of the model are in the range of recommended values suggesting the model is quite fit. The results are presented in Table 4. After the model has proven as a fit model, the next step is to test the influence among variables. Table 5 shows the standardized parameter estimates and p values for hypotheses 1 - hypotheses 4. The finding suggested that all the interaction proposes are good determinants for engagement. Another finding was that student engagement has proven serve as a good determinant of student satisfaction. All standardized regression of variables were significant at $p = 0.000$ and $\alpha = 0.01$.

Table 4. Fit indices

Fit Measures	Study	Cut-off Value	Remark
CFI	0.808	CFI ≥ 0.90 = good fit 0.80 ≤ CFI < 0.90 = marginal fit < 0.80 = poor fit	marginal fit
RMSEA	0.042	RMSEA ≤ 0.08 p < 0.05	marginal fit
NFI	0.805	NFI ≥ 0.90 = good fit 0.80 ≤ NFI < 0.90 = marginal fit < 0.80 = poor fit	marginal fit

Table 5. Hypotheses testing

Description	Standardized Estimate	p value
Interaction among students → Student engagement	.169	0.000
interaction student-tutor → Student engagement	.095	0.000
interaction student-content → Student engagement	.919	0.000
Student engagement → Student satisfaction	.722	0.000

The results verified that when students become more active in online learning through interaction among students, interaction with tutors, and interaction with content, it will strengthen their engagement. This relationship will ultimately lead to student satisfaction as well. Another result also shows that interaction between student and tutor has the lowest estimate value compared to other interactions, which indicated that this variable as the weakness one.

DISCUSSION

The results of this study reinforce the results of previous studies regarding the importance of interaction and engagement in online learning to achieve student satisfaction. Some significant contribution on literature regarding online learning are as follows. First, the model has confirmed that interaction in online learning is important in creating student engagement. Second, the study also confirmed that student engagement is also important determinants in creating student satisfaction. Student engagement aims to provide positive learning experiences for students, including active learning, such as discussion in collaborative work groups, conducting presentations and discussions, sharing resources, doing assignments, and integrating case studies with reflection (Martin & Bolliger, 2018). Banna, et al. (2015) also stated that student engagement is a solution to various problems in online learning, such as school dropouts, retention, and student graduation rates. The results of present study support previous research by Gray and DiLoreto (2016) which confirmed that student engagement mediates the relationship of learner interaction and student satisfaction. This result also supports previous research by Eom (2009). The research was focus on the importance of interaction in online environment; that interaction in online courses has recognized as the most important structure in determining the quality of web-based course.

This research was conducted in the open education institution that implements distance learning. In the distance learning environment is somewhat different from the face-to-face environment. When learning is conducted online, students have limitations to interact with other parties in learning, such as other students, tutors, or content. We design our e-learning as asynchronous learning which means that communication can only be done in one direction at the same time. When students have questions related to the subject being studied, students can ask other parties such as tutors or peers, but these questions cannot be answered immediately. The system will save the question and other students or tutors can answer it when they log into the system. Such system obviously has weaknesses when interactions cannot be carried out directly. Therefore, the step we can take in this matter is to encourage tutors to always be active in online learning so that it makes easier for students to interact.

In an online learning environment, easiness of interaction is the key to student learning success. Therefore, system reliability and tutor's speed response become important aspects in this regard. Unfortunately, the result of this study indicates that the interaction between students and tutors has the lowest estimate value. This result is contrary to previous research by Gray and DiLoreto (2016) and Kuo, et al. (2013). We investigated various possibilities that caused it to be happened by reviewing to the questionnaire. The items that measure interaction between student-tutor refer to tutor's activity in encouraging student to be active during learning process. The low estimate value might be caused by two reason. First, respondents might think that the role of tutors in this matter is not significant for them. Since the respondents have become accustomed to study independently via online, it is obvious that they can learn by themselves. Alternatively, second, respondents might think that tutors are not encourage them in online learning. These results require further research so that definitive causes can be determined so that appropriate practical implications can be implemented.

CONCLUSION

This study aims to analyze the effect of interaction in online learning on student engagement and the effect of student engagement on student satisfaction. The results showed that all interaction patterns, namely interactions between students, interactions between students and tutors, and student interactions with content have proven to have a positive effect on student engagement. Likewise, student engagement also has proven to have a positive effect on student satisfaction. The results of this study are expected to serve as evidence of improvements in the implementation of online learning at our university. The key result that interaction is an important variable to achieve student satisfaction, we must strive to improve our online learning system, so that students can more easily interact in online learning. However, this research has several weaknesses, among others we cannot examine in more depth precisely how interactions can strengthen student engagement. We also expect that future studies can continue to refine this research by analyzing more deeply, for example by qualitative research, which interaction factors can strengthen student engagement.

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AN ANALYSIS OF THE LONGITUDINAL MEASUREMENT INVARIANCE OF THE SOCIAL PRESENCE SCALE DEVELOPED FOR OPEN AND DISTANCE LEARNING ENVIRONMENTS

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Received: 05/10/2019 **Accepted:** 09/06/2020

ABSTRACT

As with all fields of social sciences, open and distance learning studies frequently use self-reports in their collection of data. Similarly, as with all measurement tools, proof of construct validity through statistical processes is important for testing hypotheses based on the findings, making decisions, and essentially ensuring the tools and methods used are fit for purpose. During construct validity testing processes, the reporting of findings regarding measurement invariance of a scale is an important element that is often neglected. This study aims to portray the longitudinal invariance of the Social Presence Scale (Cakmak, Cebi & Kan, 2014), which is frequently used to determine the social presence in open and distance learning environments research and has confirmed construct validity in the literature, through repeated measurements obtained in an experimental study. This research was conducted on 280 learners in a 3-month interval. The data gathered was analyzed for measurement invariance using the Mplus 7.0 software package in accordance with the four stages described in the literature. The measurement invariance tested in each stage were studied for ΔCFI, and ΔRMSEA values in addition to likelihood chi-square. The findings indicate the conditions required for measurement invariance in each stage, or in other words, the longitudinal invariance of the scale was achieved. The findings of this study may provide a precedent for similar studies in the future.

Keywords: Measurement invariance, longitudinal data, confirmatory factor analysis, open and distance learning, social presence

INTRODUCTION

Stemming from computer-aided communication environments (Lowenthal, 2010) and an imperative element of online learning environments (Akcaoglu & Lee, 2016), social presence is defined by Garrison (2011) as "Learners being able to adapt to the workgroup, communicate in a safe environment, and develop personal and emotional relationships in stages while reflecting their personalities".

The concept of social presence, which emphasizes the necessity for encouraging social interaction as a tool for directing learners towards critical thinking and higher-level learning (Garrison & Akyol, 2013), has

led researchers and practitioners to study not merely what social presence is, but also the roles it plays in online learning processes due to its direct relevance in online learning processes (Annand, 2011; Kreijns et al., 2014; Lowenthal, 2010; Oztok & Brett, 2011). With these studies, it was determined that social presence influences various factors in the learning experiences of learners. The findings were that social presence may positively influence: participation and motivation to participate in learning processes (Jorge, 2010), satisfaction with the learning process (Cobb, 2009; Hostetter & Busch, 2006; Richardson & Swan, 2003; Strong et al., 2012), perceived learning (Hostetter, 2013; Joksimovic vd., 2015; Kang ve Im, 2013; Richardson ve Swan, 2003; Russo ve Benson, 2005), academic achievement (Joksimovic vd., 2015), and interaction levels (Boston vd., 2009). Similar to these results, a study by Richardson and Swan (2003) determined that learners with high levels of social presence perception in an online learning process had both higher satisfaction from the learning process, and greater perceived learning levels compared to learners with lower social presence.

As a fundamental requirement that ensures the synchronous implementation of many components such as instructors, learners, and content (Whiteside, 2015); knowing the positive and negative influences on social presence is seen as a guide for researchers who aim to increase social presence in learning processes. Considering an increase in the social presence levels of learners results in increased satisfaction regarding the online learning process (Borup et al., 2012; Horzum, 2015), it may be stated that designs that increase social presence levels are necessary. As such, designs that allow for interaction should be implemented (Kilinc, 2020). By portraying the individual personalities of learners in open and distance learning environments, allowing the development of personal and emotional relationships, the concept of social presence thereby minimizes the feeling of loneliness and studies indicate that it must be measured correctly and an action plan must be developed accordingly. In other words, studies show that the measurement of the social presence of learners must be conducted in accordance with the projected purpose of measurement. This can only be ensured with a high level of validity of the measurement tool being used. Thus, experimental studies may more accurately and reliably measure the influence of the experiment on social presence and ensure the researchers achieve more accurate findings based on these results.

Research Purpose

As with all fields of social sciences, self-reports are frequently used in the data gathering process of research in open and distance learning. As with all measurement tools, it may be stated that the statistical processes applied in determining construct validity in self-reports are highly important for establishing a basis for important issues such as testing a hypothesis based on the findings, or making important decisions based on these tools and methods by ensuring they are fit for purpose. When testing construct validity, exploratory factor analysis (EFA) is used when lacking a strong a priori regarding the construct while confirmatory factor analysis (CFA) is used in the presence of a strong a priori to test an existing model. Based on the findings regarding construct validity, the mean scores obtained from the scale may be used to compare groups or repeated measurements. However, in these instances throughout this process where the need to present evidence of construct validity is often overlooked is measurement invariance. As such, before comparing the measurements among different groups or among repeated measurements, the measurement tool must have proven to sustain the same factorial structure between these groups or repetitions.

The goal of this study is to portray the longitudinal invariance of the Social Presence Scale (Cakmak, Cebi & Kan, 2014), which is frequently used to determine social presence levels in open and distance learning environments and has had its construct validity confirmed using CFA in previous studies in the literature (Elcicek, Erdemci ve Karal, 2018; Ercan ve Bulbul, 2019; Kilinc, 2020; Matanaghi, 2015), through repeated measurements conducted within the scope of an experimental study. The findings of this study are believed to provide an example for future research into an often neglected aspect of longitudinal studies in the future.

METHOD

Research Design

This is a correlational study that aims to test the longitudinal invariance of the Social Presence Scale developed by Cakmak, Cebi and Kan (2014) based on repeated measurements conducted within the scope of an experimental study. To this end, the four stages of measurement invariance were tested. The first stage is the model-data fit test of the basic model. In each following stage, certain parameters for two groups/measurements are fixed; forced into equal estimation. Thus, any significant reduction in model-data fit as the model is further restricted through each stage is determined (Widaman & Reise, 1997). The details of measurement invariance and the procedures conducted within this study are explained in detail below.

Measurement Invariance

Measurement invariance may be defined as the measurement tool presenting the same structure, or same meaning, resulting from repeated applications on the same group or on groups differentiated based on a specific characteristic (Marsh, Parker & Morin, 2015). In other words, measurement invariance is proving that the differentiation observed between groups or in repeating data sets regarding the quality being measured by the measurement tool is not caused by the measurement tool itself. A lack of measurement invariance results in ambiguity regarding the source of potential differences in measurement results: one cannot know if the differing results are due to the differences in measurements (repeated on the same group), the groups themselves, or measurement tool.

Traditional Confirmatory Factor Analysis (CFA) is not sufficient to ensure measurement invariance. To this end, advanced structural equation modelling methods are utilized. If the invariance of the scale in different groups is being studied, multi-group CFA is applied. If the scale is applied to the same group at certain time intervals, measurement invariance must also be ensured. This situation is called longitudinal invariance and is studied through the same invariance stages as multi-group applications; only invariance is tested for repeated measurements taken from the same individuals. Researchers in the field may have studied measurement invariance with different numbers of stages (e.g., Chen, Sousa, & West, 2005; Cheung & Rensvold, 1999; Ferrer, Balluerka, & Widaman, 2008; Little, 1997; Millsap & Meredith, 2007; Nesselroade, 1983; Rensvold & Cheung, 1999), yet it may be stated that a consensus has been achieved on the four-stage approach (Basusta, 2010).

Stages of Longitudinal Measurement Invariance

The analysis of longitudinal measurement invariance consists of four stages. These stages are as follows in order of increasing restriction (Dimitrov, 2010; Putnick & Bornstein, 2016; Widaman & Reise, 1997):

Configural Invariance: In this model, no parameters are forced into equal estimation in repeated applications. Therefore, it is the most basic model. All parameters, for both groups or measurements, are estimated freely. If good fit values are obtained in this stage, the analysis progresses to the next stage. If the model-data fit indices are indicative of a poor fit, the analysis does not proceed to other stages and it is concluded that invariance cannot be obtained.

Metric Invariance: This analysis is conducted to show that the relationship between the latent variable and its indicators does not change with repeated measurements. As such, the factor loadings are restricted in repeated measurements; in other words, during measurements (regardless of how many measurements are conducted), equal estimation is forced. If the values that emerge with this restriction do not reveal worse fit than the first model, it is concluded that metric invariance is achieved. Otherwise, it is concluded that metric invariance cannot be ensured and the analysis does not progress to the next stage.

Scalar Invariance: In addition to the previous stage, the intercepts of the regression equation determined for the items are forced to equal estimation in measurements. If no significant degradation in the model emerges following the restriction, it is concluded that scalar invariance is achieved.

Strict Invariance: This stage is directed at the item variances that are not shared with the latent variable and residual/error variances being stable in groups-measurements. As with other processes, the invariance is determined by comparison with the previous model. Some researchers state that strict invariance is not necessary in practice.

All of the aforementioned stages are summarized in the table 1 below.

Table 1. Fixed and freely estimated parameters in measurement invariance process

Invariance Stage	Factor Loading	Intercepts	Residual Variances
Configural	*	*	*
Metric	Fixed	*	*
Scalar	Fixed	Fixed	*
Strict	Fixed	Fixed	Fixed

Table 1. summarizes which parameters are forced into equal estimation in each stage, from the most general model to the most restricted model. In each invariance stage, values that are fixed for the measurements may be seen in the common factor model below.

Common Factor Model:

$$Y = \tau + \lambda . n + \varepsilon$$

Y: Observed Variable (Score of Person)
τ: Intercept
λ: Factor Loading
n: Latent Characteristic of Individual Measured by Item
ε: Residual Variance

Measurement invariance is possible as long as the four invariance models explained in detail above are ensured. Stages following configural invariance are based on comparison with the previous model. As each model is nested in the previous, the change in the model fit is examined using a likelihood ratio chi-square difference test (Bentler & Bonett, 1980). However, since likelihood ratio tests are sensitive to sample size, the change in model fit should also be evaluated based on the amount of change in fit indices (Widaman, Ferrer & Conger, 2010) such as RMSEA and CFI. As such, analyzing the ΔCFI and ΔRMSEA values and considering values above .01 as significant has been proposed (Cheung & Rensvold, 2002; Little 1997; Vandenberg & Lance, 2000). In other words, a difference of more than .01 in RMSEA and CFI between two models is interpreted as a significant degradation in the model as a result of restriction, and that measurement invariance was not achieved in the related stage.

The four invariance stages stated in this article were analyzed in the order determined in the literature and the results were reported. All analyses were conducted using the Mplus 7.0 (Muthen & Muthen, 1998-2020) software package. When comparing each stage to the previous, the change in model-data fit indexes were studied in addition to the likelihood ratio chi-square difference test, and ΔCFI and ΔRMSEA values were analyzed for instances where their values exceeded .01. All Mplus syntaxes (codes) are given in Appendix A.

Participants

Within the scope of this study, the longitudinal measurement invariance of the Social Presence Scale developed by Cakmak, Cebi and Kan (2014) was studied through repeated measurements. The study was conducted with the participation of learners in the Open Education System. Through experimental research, data was gathered at three-month intervals from 280 volunteer students.

FINDINGS

Firstly, through this study, model data fit was obtained for configural invariance. As stated earlier, the testing of each stage requires that all parameters are freely estimated through configural invariance in both measurements. As such, the fit indices obtained are presented in table 2.

Table 2. Model-fit indexes of the configural invariance model

Fit Index	Value	Goof Fit Cut-Off	Rationale
χ2/df	1.98	<2.5	Tabachnick & Fidell (2007)
RMSEA	.062 (.056 - .067)	<.08	Hooper et al. (2008)
CFI	.92	>.90	Hu & Bentler (1999)
TLI	.89	>.90	Hooper et al. (2008)
SRMR	.061	<.08	Hu & Bentler (1999)

The first value presented in Table 2 is obtained by dividing the chi-square value with the degrees of freedom. The expectation in structural equation modelling applications is that the difference between the chi-square values of the observed and expected correlation matrices would not be statistically significant. However, as chi-square values are influenced by sample size, they tend to yield statistical significance (Bentler & Bonnet, 1980). Therefore, the value obtained by dividing the chi-square value with the degrees of freedom (df) is used. A resulting value below 2.5 is considered perfect fit (Tabachnick & Fidell, 2008). The value of 1.98 obtained in this study is within the parameters of a perfect fit. An RMSEA value under .08 for the obtained fit indices is indicative of a good fit, while a value under .05 is indicative of a perfect model-data fit (Hooper et al., 2008). As such, it may be stated that the .062 value obtained indicates a good model-data fit. For CFI and TLI indexes, perfect model-data fit is accepted for values above .95 while .90 and above values are considered acceptable (Hu & Bentler, 1999). Therefore, the .92 value obtained for CFI indicates good fit while the .89 value obtained for TLI is very close to the lower threshold. The evaluation of SRMR is approached in a manner similar to RMSEA; it may be stated that a value of .061 is indicative of a good model-data fit.

In light of these value obtained for model-data fit, it was observed that the model-data fit value for configural invariance, where all parameters are freely estimated in both measurements, was at an acceptable level. In other words, it was concluded that as the first stage of measurement invariance, configural invariance was achieved. In the second stage, values will be obtained for metric invariance and these values will be compared to the fit values obtained for configural invariance in the first stage.

The chi-square value obtained for metric invariance, which forces equal estimation of the factor loadings in both measurements, was subtracted from the chi-square value obtained for configural invariance (see Table 3), with the resulting 21.839 value being statistically insignificant at .05 for the difference in the degrees of freedom for both models, which was 14. This value indicates no significant degradation in the model when the factor loadings are forced to be equally estimated in the measurements, in other words ensuring metric invariance. Similarly, the ΔRMSEA and ΔCFI values for both models were less than .01, which also indicates that metric invariance is achieved.

The third stage of measurement invariance is testing for scalar invariance. In the second row of Table 2, the differences between the chi-square and degrees of freedom for the scalar and metric invariance models are portrayed. The aim here is to test the scalar invariance based on the equal estimation of intercepts in both models. However, after entering the scalar invariance syntax, the analysis would not terminate without the iterations failing to complete due to the number of iterations being exceeded. This situation may be considered to be caused by the increasing complexity of the model and the sample size being relatively small for this complex model. To resolve this issue, the Bootstrap method was used. With this command, the analysis was repeated for 500 runs, and the degrees of freedom difference of the obtained chi-square difference was found to be statistically significant. At this point, the intercepts that interfere with invariance

should be determined by observing modification indices. However, modifications are not accounted for when using the Bootstrap method in Mplus, and no other programs that resolve this issue exist. Therefore, this procedure could not be executed. Despite this setback, the change in the CFI and RMSEA values were observed to be lower than .01, in other words the changes in these values were not statistically significant. In instance where the sample is relatively large and where the restrictions in the invariance stages cause significant degradation in model fit statistics, if there is no appreciable change in the practical fit indices, the researcher may prefer the more restricted model despite the worse statistical fit, due to its superior interpretive value (Widaman, Ferrer & Conger, 2010). Based on this deliberation, it was concluded that the current situation did not hinder scalar invariance.

Table 3. Analysis results of longitudinal invariance

Invariance Stage	$\Delta\chi 2$(df)	ΔRMSEA	ΔCFI
Configural - Metric	21.84 (14)	< .01	< .01
Metric – Scalar	23.17 (12)*	< .01	< .01
Scalar – Strict	29,73 (20)	< .01	< .01

*$p < .05$

In the final stage, strict invariance was tested. The difference of 29.73 obtained with the chi-square from the previous stage (see Table 3) was found to be statistically insignificant in 20 degrees of freedom. Supporting this situation, the ΔCFI and ΔRMSEA values were observed to be under .01. In other words, it was concluded that strict invariance was achieved.

Within the scope of this study, no instances in which the longitudinal invariance of the Social Presence Scale was questionable were encountered. Despite increased restrictions during each stage of testing, no significant changes were recorded in the model-data fits. However, the lack of modifications as a result of utilizing Bootstrap enforces a limitation on this study in that no inferences could be made regarding the intersection points as the probably source of any possible significant difference between the metric and scalar models. In general, it may be stated that there are no impediments to the comparison of pre-post test differences through repeated measurements.

DISCUSSIONS AND CONCLUSION

Self-report questionnaires are still frequently used in various fields of social sciences. When conducting the validity analysis of these measurement tools, only the basic factor analytic applications are often conducted when testing construct validity. Most simplistically, the equivalence between groups of the latent structure trying to be measured – the measurement invariance – should be examined before, for example, testing differentiation based on gender. Otherwise, the source of any potential difference that emerges, whether the difference is truly from group association or due to the scale working differently for two groups, cannot be determined. Similarly, especially with experimental studies, when a scale is applied to a group in certain time intervals, the difference between these measurements must be tested in advance to ascertain the function of the experimental study, which requires that the measurement tool is interpreted and works identically on individuals in both measurements through the establishment of longitudinal invariance. In this study, data gathered from the Social Presence Scale applied in an experiment conducted within a course in the Open Education System was used, with the application of the scale being repeated at two different times for the analysis of longitudinal invariance. Measurement invariance is achieved by testing the four stages concurred upon in the literature. As such, if the model-data fit statistics obtained for the first stage of configural invariance are good, the model is restricted in each subsequent stage, and no statistically significant degradation is expected to occur as a result of these restrictions if invariance is achieved. Following this process, configural invariance for the Social Presence Scale was achieved, and it was determined that

the restrictions applied as required by the invariance model in each subsequent stage did not significantly degrade the model compared to the previous stage. Combining all these results, it was concluded that the scale achieved longitudinal invariance.

Various decisions, acceptance or rejection of hypotheses, or new decisions by policymakers are all likely based on results obtained by measurement tools. Therefore, for all studies to be able to rely on the data obtained from measurement tools, they must ensure that these tools measure the latent variable they aim to measure. In this process that requires the determination of structural validity, the need to test the structural equivalence of data obtained from different groups or measurements is often neglected and possibly lesser-known. It is believed that this study may provide an example for research regarding establishing construct validity in data-gathering processes in the field of open and distance learning. The findings of this study are significant in ensuring that the results obtained from the social presence scale, which is an important scale used in open and distance learning environments, are obtained purposefully. In accordance with the findings of this study, the contribution of the experiment to social presence can be measured more accurately and reliably in experimental studies, ensuring researchers achieving more accurate findings based on these results.

RECOMMENDATIONS

Recommendations from the Study

Measurement invariance studies consist of models that increase in complexity in each stage. Therefore, it is possible that iterations occasionally do not occur. It is therefore recommended that researchers take this into consideration and conduct their analyses with relatively large sample sizes.

Recommendations for Researchers

It is noted that longitudinal invariance is often neglected in longitudinal research based on repeated measurements. It is recommended that researchers gain awareness in this regard and report invariance in similar studies.

The reporting of invariance results of studies where the number of measurement repetitions (three, four, …) may better portray the possible influence of time on invariance status.

In instances where within the scope of the study data is accepted as ordinal rather than continuous, the comparison of the analyses conducted with different estimation methods – primarily WLSMV – with these findings may contribute to the literature.

The scale used in this study has been verified in accordance with the correlated traits factor model. The conclusion of the invariance processes of this scale based on other factor analytic models such as second-order and bifactor may be studied.

Similarly, the traditional methods obtained in this study may be compared with invariance methods based on exploratory structural equation modelling, and the result may prove interesting.

Researchers in the field of open and distance learning must conduct longitudinal invariance studies on the various important scales in the field in addition to the social presence scale such as; the sense of community scale/index, learner satisfaction index, transactional distance scale, learner attitude scale, self-directed learning skills index, and many other scales and indexes. This would ensure that the findings obtained from the use of scales in the field of open and distance learning are more accurate.

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APPENDIX A

Mplus Syntax for Testing the Longitudinal Invariance of the Three Dimensional Scale

TITLE:	**Configural Invariance** (All parameter free)
DATA:	FILE IS "long_MI.dat";
VARIABLE:	NAMES ARE m1-m34;
	MISSING ARE all (-99);
MODEL:	duysPRE by m1-m5;
	etkmPRE by m6-m12;
	adytPRE by m13-m17;
	duysPOST by m18-m22;
	etkmPOST by m23-m29;
	adytPOST by m30-m34;
	[duysPRE duysPOST];
	[etkmPRE etkmPOST];
	[adytPRE adytPOST];
	[m1@0 m6@0 m13@0 m18@0 m23@0 m30@0];
OUTPUT:	SAMPSTAT STDYX MODINDICES RESIDUAL;

TITLE:	**Metric Invariance** (Invariant factor loadings)
DATA:	FILE IS "long_MI.dat";
VARIABLE:	NAMES ARE m1-m34;
	MISSING ARE all (-99);
MODEL:	duysPRE by m1 m2(1) m3(2) m4(3) m5(4);
	etkmPRE by m6 m7(5) m8(6) m9(7) m10(8) m11(9) m12(10);
	adytPRE by m13 m14(11) m15(12) m16(13) m17(14);
	duysPOST by m18 m19(1) m20(2) m21(3) m22(4);
	etkmPOST by m23 m24(5) m25(6) m26(7) m27(8) m28(9) m29(10);
	adytPOST by m30 m31(11) m32(12) m33(13) m34(14);
	[duysPRE duysPOST];
	[etkmPRE etkmPOST];
	[adytPRE adytPOST];
	[m1@0 m6@0 m13@0 m18@0 m23@0 m30@0];
OUTPUT:	SAMPSTAT STDYX MODINDICES RESIDUAL;

TITLE:	**Scalar Invariance** (Invariant factor loadings + invariant intercepts)
DATA:	FILE IS FILE IS "long_MI.dat";
VARIABLE:	NAMES ARE m1-m34;
	MISSING ARE all (-99);
ANALYSIS:	TYPE IS GENERAL;
	ESTIMATOR IS ML;
	ITERATIONS=100000;
	CONVERGENCE=0.00005;
	BOOTSTRAP=500;
MODEL:	duysPRE by m1 m2(1) m3(2) m4(3) m5(4);
	etkmPRE by m6 m7(5) m8(6) m9(7) m10(8) m11(9) m12(10);
	adytPRE by m13 m14(11) m15(12) m16(13) m17(14);
	duysPOST by m18 m19(1) m20(2) m21(3) m22(4);
	etkmPOST by m23 m24(5) m25(6) m26(7) m27(8) m28(9) m29(10);
	adytPOST by m30 m31(11) m32(12) m33(13) m34(14);
	[duysPRE@0 duysPOST etkmPRE etkmPOST adytPRE adytPOST];
	[m1 m18](15);
	[m2 m19](16);
	[m3 m20](17);
	[m4 m21](18);
	[m5 m22](19);
	[m6 m23](20);
	[m7 m24](21);
	[m8 m25](22);
	[m9 m26](23);
	[m10 m27](24);
	[m11 m28](25);
	[m12 m29](26);
	[m13 m30](27);
	[m14 m31](28);
	[m15 m32](29);
	[m16 m33](30);
	[m17 m34](31);
OUTPUT:	SAMPSTAT STDYX MODINDICES RESIDUAL;

TITLE:	**Strict Invariance** (Invariant factor loadings + invariant intercepts + invariant residual va)
DATA:	FILE IS "iodI_MI.dat";
VARIABLE:	NAMES ARE m1-m34;
	MISSING ARE all (-99);
ANALYSIS:	TYPE IS GENERAL;
	ESTIMATOR IS ML;
	ITERATIONS=100000;
	CONVERGENCE=0.00005;
	BOOTSTRAP=500;
MODEL:	duysPRE by m1 m2(1) m3(2) m4(3) m5(4);
	etkmPRE by m6 m7(5) m8(6) m9(7) m10(8) m11(9) m12(10);
	adytPRE by m13 m14(11) m15(12) m16(13) m17(14);
	duysPOST by m18 m19(1) m20(2) m21(3) m22(4);
	etkmPOST by m23 m24(5) m25(6) m26(7) m27(8) m28(9) m29(10);
	adytPOST by m30 m31(11) m32(12) m33(13) m34(14);
	[duysPRE@0 duysPOST etkmPRE etkmPOST adytPRE adytPOST];
	[m1 m18](15);
	[m2 m19](16);
	[m3 m20](17);
	[m4 m21](18);
	[m5 m22](19);
	[m6 m23](20);
	[m7 m24](21);
	[m8 m25](22);
	[m9 m26](23);
	[m10 m27](24);
	[m11 m28](25);
	[m12 m29](26);
	[m13 m30](27);
	[m14 m31](28);
	[m15 m32](29);
	[m16 m33](30);
	[m17 m34](31);
	duysPRE duysPOST(32);
	etkmPRE etkmPOST(33);
	adytPRE adytPOST(34);
	m1 m18(35);
	m2 m19(36);
	m3 m20(37);
	m4 m21(38);
	m5 m22(39);
	m6 m23(40);
	m7 m24(41);
	m8 m25(42);
	m9 m26(43);
	m10 m27(44);
	m11 m28(45);
	m12 m29(46);
	m13 m30(47);
	m14 m31(48);
	m15 m32(49);
	m16 m33(50);
	m17 m34(51);
OUTPUT:	SAMPSTAT STDYX MODINDICES RESIDUAL;

INTEGRATION OF BALANCED SCORECARD AND SIX SIGMA IN MEASURING OPEN UNIVERSITY ACADEMIC SERVICES PERFORMANCE

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Received: 12/09/2019 **Accepted:** 11/06/2020

ABSTRACT

Performance appraisal is one of the activities carried out by the organization to assess performance quantitatively. One of the performance assessment methods used is Six Sigma and the Balanced Scorecard. Six Sigma is an organizational approach to improve operational excellence, while the Balanced Scorecard provides a framework for transforming organizational strategies into work matrices that help organizations compete. Strategic business plans can be implemented using the Balanced Scorecard (BSC) performance management system approach, while various action programs can be applied using the Six Sigma approach. Both methods can be integrated to synergize in achieving the company's strategic goals. This study aims to measure the performance of Open University academic services with the integration of BSC and Six Sigma in the field of academic services. Through this integration, performance measurement was focused on quality control by exploring UT's academic service system as a whole and combined with four perspectives in the Balanced Scorecard. The results showed the level of student satisfaction with UT's academic services of 90.20% which means that students are very satisfied with UT's academic services which include programs of distance education and programs, models, teaching materials (modules and non-print teaching materials), face-to-face tutorials and online tutorials, learning assistance counselling services, and learning evaluation. Meanwhile, measurement using Six Sigma shows that UT academic services are at level 3, which means there are still some UT services that are not perfect, especially in tutorial and teaching materials services.

Keywords: Academic services performance, six sigma, balanced scorecard.

INTRODUCTION

Performance is the work of an organization to realize its strategic objectives, customer satisfaction and contribution to the strategic environment. So that the determination of performance indicators based on the formulation of the strategic plan, vision, mission and organisational goals (Akdon, 2011). To know with certainty whether an organisation performance has been able to achieve the strategic objectives set, a series of performance measurement and evaluation is needed. The primary purpose of implementing a performance measurement system is to improve organizational performance so that it can better serve customers, employees, owners, and stakeholders. So that performance in the organization can be managed properly, it requires performance management. Armstrong (2006) states that: performance management defined as a systematic process for improving organizational performance by developing the performance of individuals and teams.

There are various methods of performance measurement that are applied in organizations, for example, Six Sigma and Balanced Scorecard. Six Sigma is an organizational approach to operational excellence that has existed since it launched at Motorola in the 1980s (Hidayat, 2007). Meanwhile the Balanced Scorecard provides a framework for transforming organizational strategy into a work matrix forward-looking that helps organizations compete. Strategic business plans can be implemented using to management system approach Balanced Scorecard, while various action programs can be implemented using the approach Six Sigma.

The study discusses the integration of Six Sigma and the Balanced Scorecard in measuring the performance of the organization has not so much, especially in educational studies. . Research that discusses the integration of Six Sigma and the Balanced Scorecard was proposed by Heavy and Murphy (2011) which explains the added value of the integration of the Balanced Scorecard with Six Sigma. Other research that discusses the integration of these two methods in the field of education is explained by Holmes, et.al., (2014). Both of these studies provide references and guidelines on how to integrate the Balanced Scorecard and Six Sigma for performance and specific measurements in the world of education.

Performance measurement with the integration of BSC and Six Sigma is very appropriate to be carried out at the Open University besides the performance measurement that has applied so far. This is done so that the Open University can measure UT performance through different perspectives, to obtain additional data on UT performance, especially those relating to student academic services. The implementation of academic services is carried out at the Central UT and 39 Distance Learning Service Units which are spread across 34 provinces and one UT UTB Foreign Service UPBJJ. The services provided are in accordance with standards that have been standardized in the UT Quality Assurance System (SIMINTAS UT) which has accredited, both national and international accreditation. The purpose of this quality assurance is the creation of continuous improvement in academic and non-academic services and will ultimately affect student satisfaction.

Due to the broad reach of the UT working area and the variety of academic services provided, the integration of BSC and Six Sigma needed as one of the measurements of Open University performance in the field of academic services. Through this integration, performance measurement is focused on quality control by exploring UT's overall academic service system and combined with the four perspectives in the Balanced Scorecard. This service is related to the vision and mission of UT and the focus of Academic Quality Development which includes policies regarding educational programs and curriculum, teaching materials, learning assistance services, evaluation of learning outcomes, as well as research and community service.

This research is based on the results of research by Heavy and Murphy (2011) and Holmes, et.al. (2014), but using a different approach. In previous studies, they have discussed how the results of the integration of BSC and Six Sigma, while in this study will begin with the development of Six Sigma and BSC. While the evaluation and measurement of performance with the integration of these two models will be carried out the following year.

Russel and Taylor (2006) define Six Sigma as "a process for developing and delivering near products and services". Six Sigma defined as a process for developing near-perfect products and services in order to obtain results that are close to "zero defect". Six Sigma's focus is to prioritize customers by using data to get facts and data to get better solutions. The target of Six Sigma achievement is in three main areas, namely: (1) Improving customer satisfaction; (2) Reducing cycle times; and (3) Reducing defects. Six Sigma quality improvement programs can be implemented with a variety of methodologies. One method commonly used is to use the DMAIC (Define, Measure, Analyze, Improve, and Control) model approach. But there are also other methods that can be used, namely the IDOV method (Identify, Design, Optimize, and Verify) (Gaspersz, 2007). For the Six Sigma method to be implemented with an intensive Six Sigma quality improvement program, it must involve the top-level management intensively.

The Balanced Scorecard (BSC) is a measure of company performance so that companies can measure long-term performance by using indicators and specified benchmarks. The balanced scorecard provides answers to four fundamental questions on four perspectives, namely: (1) Customer and stakeholder perspectives; (2) Financial Perspective; (3) Employee and organization capacity Perspective; and Internal Business Process Perspective. Many organizations use the BSC as a foundation for a strategic management system. The BSC reflects a balance between short-term and long-term goals, financial and non-financial measures, lagging and leading indicators and perspectives on external and internal performance (Hepworth, 1998).

The added value of the BSC is a combination of all major business areas and identifying and clarifying the interrelationships of each perspective to produce success (Hepworth, 1998). This added value allows the company to know the financial condition simultaneously by monitoring progress in building capabilities and obtaining the intangible assets needed for growth (Kaplan and Norton, 2007). Scorecards place strategy and vision at the core of organizational goals, not control (Kaplan and Norton, 1992).

INTEGRATION OF THE BALANCED SCORECARD WITH SIX SIGMA

Based on an understanding of the objectives and workings of Six Sigma and the BSC it can be concluded that Six Sigma provides a structured tool for defining business problems through customer perception, measuring performance baselines, and prioritizing the root causes of implementing solutions and controls. Increasing Six Sigma metrics to a higher level indicates a smaller production error rate. This increase can collectively influence the achievement of the level of performance indicators to a higher level. The combination of Six Sigma with BSC can overcome the weaknesses of BSC in providing solutions and provide problem-solving capabilities for high-level performance metrics. Six Sigma is driven by a deep understanding of customer needs, rigorous use of facts, data and statistical analysis, and diligent attention to managing, improving and re-creating business processes (Pande et.al., 2000). The strength of the BSC is its ability to translate strategies into relevant organizational metrics and performance measures while Six Sigma provides tools and methods to improve performance metrics and achieve the organization's vision and mission. Six Sigma also helps provide problem-solving in achieving performance in a systematic and structured manner.

Performance measurement indicators at BSC are poured into KPI (Key Performance Indicator). But if KPI does not reach the target after performance measurement, then Six Sigma programs consisting of Define, Measure, Analyze, Improve, and Control (DMAIC) stages can use. DMAIC can overcome various problems such as reducing defective products, reducing production costs due to waste, improving product quality, etc. The expected quality target in implementing the Six Sigma methodology is to improve process capability by achieving 3.4 DPMO (defects per one in the process production) 3.4 DPMO means 3.4 defects in 1 million opportunities DPMO is one of the process capability assessments to measure how good a production process is, Alastair (2003) explains that the combination of the balanced scorecard with Six Sigma is a breakthrough in business performance named "Business Improvement System." Ad five components in combining a balanced scorecard with Six Sigma, including (1) Voice of the customer (VOC); (2) Optimal process; (3) Reform management; (4) Project or initiative selection; and (5) Project implementation or initiative. The method for integrating the two management systems is to see the suitability of the two, which begins by translating the DMAIC or IDOV models on Six Sigma and then linking them to the activities on the Balanced Scorecard. The focus of attention is primarily on how the objective components and measures of each Balanced Scorecard perspective are linked to the continuous quality/performance improvement program of Six Sigma, with the DMAIC methodology approach.

METHOD

Development of integration of balanced scorecard and six sigma in measuring the performance of open university academic services developed in this study uses a combination model of the Major Steps in the R&D Cycle (Borg and Gall, 1983) with the Steps of Systems Approach Model of Educational Research and Development (Gall, Joyce & Borg, 2007) in Suparman (2016). At steps 1, steps are carried out (a) research and information collecting in the form of literature reviews, surveys and interviews; (b) planning; and (c) develop preliminary products. Data obtained from the results of the questionnaire for BSC analysis were processed with the Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA). While processing six sigma uses Pareto analysis, fishbone and process capability report. Key Performance Indicators (KPI) were developed to measure the performance of distance education services (Alstete and Beutell, 2004), Griggs and Smith (2012), Mary and Santovec (2004).

Respondent

Retrieval of development integration of balanced scorecard and six sigma research data in measuring the performance of open university academic services in step 1 conducted for UT students with a survey method using a questionnaire. The focus of the study compiled with the Key Performance Index (KPI) Parmenter(2010), Alstete & Beutell (2004), Powar, KB, Panda, Santosh., Bhalla (2000) on six service groups consisting of: (1) study programs and distance learning ; (2) registration; (3) teaching material; (4) face to face tutorial and online tutorial; (5) counselling services and learning assistance; and (6) evaluation learning.

The research sample was UT students from 13 UT Regional Offices in Indonesia, with a total sample of 370 students. Samples were taken by purposive sampling method by considering the representation of the regions of Western Indonesia, Central Indonesia and Eastern Indonesia. Most of the respondents are S1 Basic Education (PGSD and PAUD students (Figure 1).

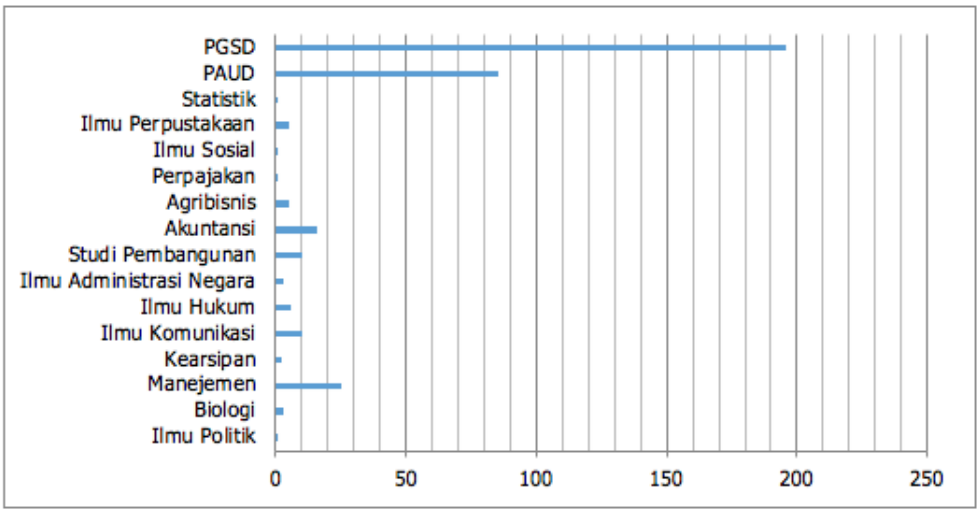


Figure 1. Respondent at program study

Analysis Method

Analysis of student satisfaction with Open University academic services quantitatively using Importance-Performance Analysis (IPA) (Lewis, 2004) and Customer Satisfaction Index (CSI) (Fandy Tjiptono and Gregorius Chandra, 2011) analysis tools. IPA is used to determine the gap between performance and expectations of service products and the CSI which is used to analyze the overall level of customer satisfaction (Handi Irawan, 2004; Nigel Hill, Self Bill, 2002; Ilieska, 2013). The results of the analysis with IPA and CSI explained in Table 1and Figure 2.

FINDINGS

Balanced Scorecard Analysis

Table 1. Customer Satisfaction Index

No	Indicators	Value
1	Distance learning and education models	91,05%
2	Registration	90,98%
3	Teaching Materials (modules and non-print teaching materials)	91,24%
4	Face-to-face tutorials and online tutorials	90,12%
5	Learning assistance counseling services	87,80%
6	Learning evaluation	88,83%
	Customer Satisfaction Index	**90,16%**

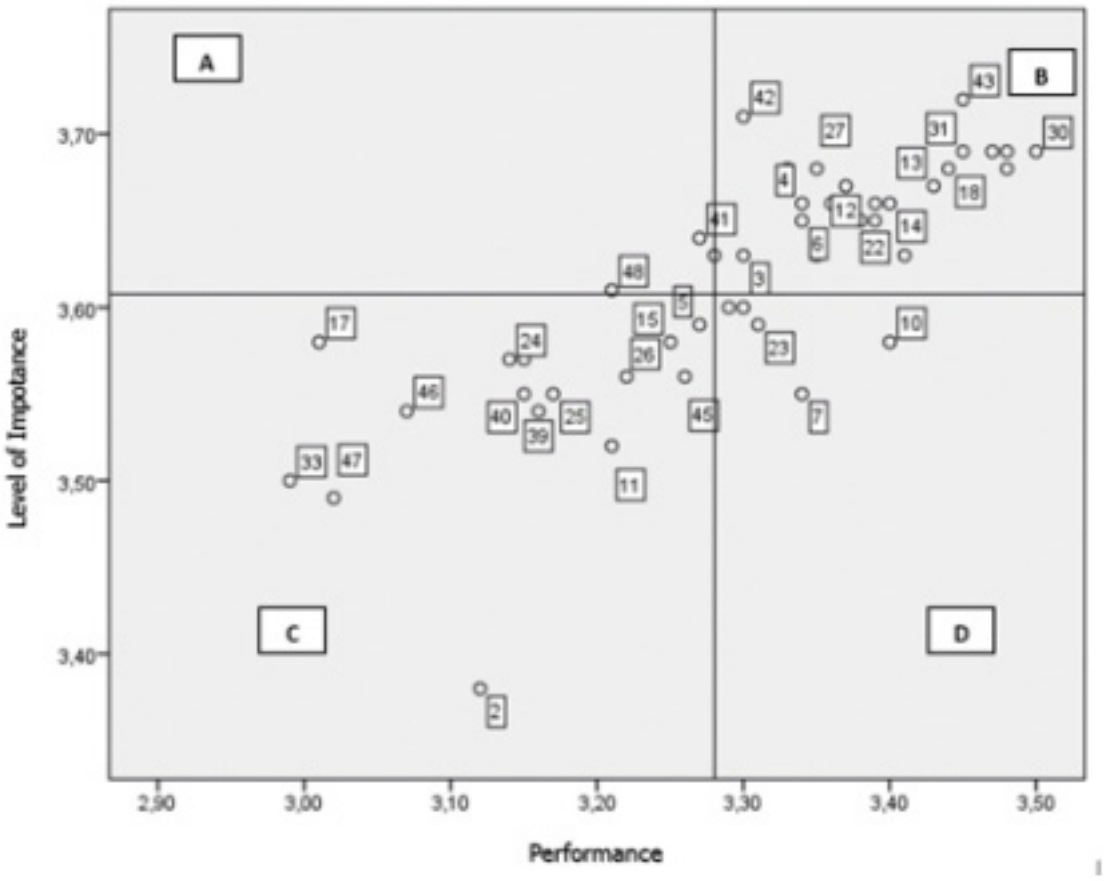


Figure 2. Index performance analysis

Table 1 shows that the level of student satisfaction with UT academic services in the six service groups is very high (90.16%). This table in line with the performance analysis index (Figure 2) which shows that 54% of UT academic service performance is in Quadrant B, which means that most of the academic services provided are in line with student expectations. 6.3% performance of UT academic services is in quadrant A, which means this service is considered very important for students, but its performance is still low. 29.2% of the performance services of UT academics assessed by students as being in Quadrant C, which means that the service is not too important for students and has low performance. 10.4% of service performance is considered not necessary by students and has reasonably high performance (quadrant D).

The performance analysis index shows that 46% of the performance of the services provided is not in line with student expectations, so the service must be improved. Meanwhile, services that considered not important should be reviewed. UT should focus on improving the performance of academic services that are important by students.

Measurement with BSC shows that KPI determined by UT was not reached 100% so that further analysis needs to be done using Six Sigma. The Six Sigma program consists of Define, Measure, Analyze, Improve, and Control (DMAIC) stages. DMAIC application can overcome various problems in the production process such as reducing defective products, reducing production costs due to waste, improving product quality and so on. Meanwhile in academic services, it is hoped that the DMAIC application can be used to analyze service lags, enhance the quality of service, reduce service costs, and improve academic service quality. So the combination of BSC with six sigma can provide a breakthrough in UT academic service performance (Alastair, 2003).

Six Sigma Analysis

Six sigma compiles the UT academic service mapping process and compares the level of importance with performance. Each academic service group is assessed through the DMAIC stages. Next, an analysis of six academic service groups with fishbone was conducted.

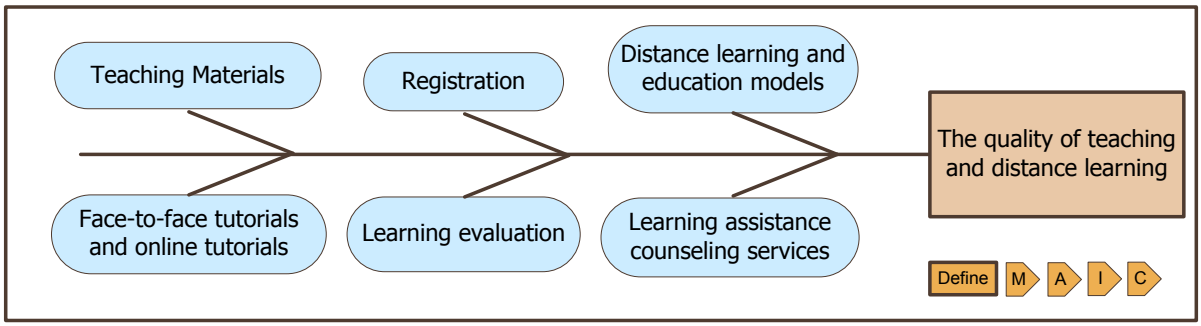


Figure 3. Fishbone

The analysis shows that the results of UT's academic services are "the quality of distance education". Whereas the six academic service groups are factors that will influence these results. Fishbone analysis is used to help identify, sort, and display various causes of UT academic services that are not in line with the performance expected by students and cannot reach the overall KPI.

Fishbone analysis continued with Pareto chart analysis. The purpose of the Pareto chart is to clarify the most important factors of several influencing factors. In quality control, this often represents the source of defects that are most frequently encountered, the types of defects that occur most often, or the reasons that most commonly occur.

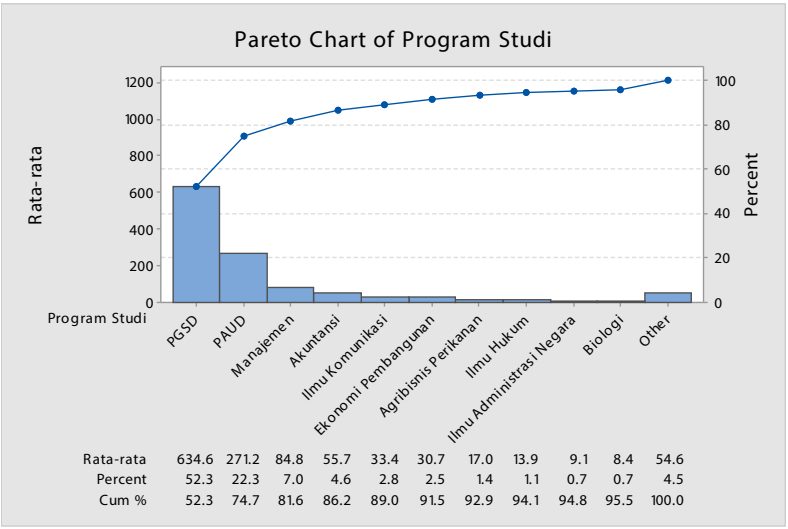


Figure 4. Pareto Performance Analysis

When there are complaints from consumers, based on the results of the Pareto chart in the study program, it appears that nearly 80% of academic service problems occur in students of Basic Education (PGSD and PAUD). This is because 55.62% of UT students are students of basic education study programs https://www.ut.ac.id/ut-in-angka. So, if UT wants to improve academic service performance and achieve the KPI that has been set to 80%, focus on improving academic services for students in basic education (Figure 4). Improvement of services for Basic Education students will have a very significant impact on improving services for Ut students as a whole.

Meanwhile, an increase in the performance of academic services that are considered important by students is also almost 60% also experienced by PGSD students and PAUD students and management study program students (Figure 5).

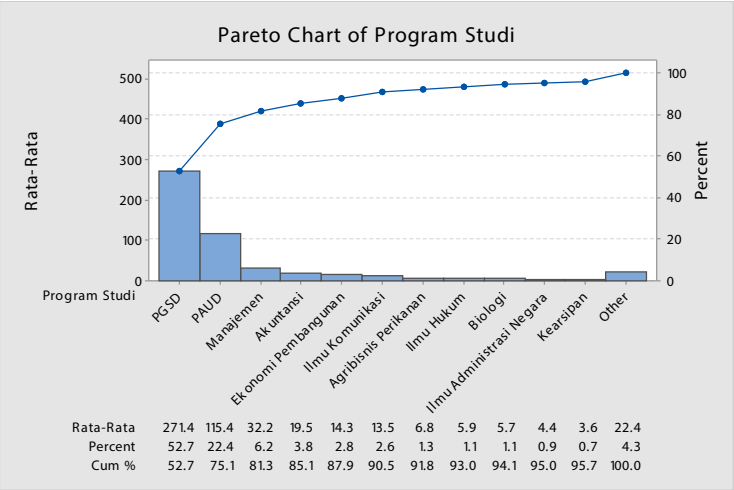
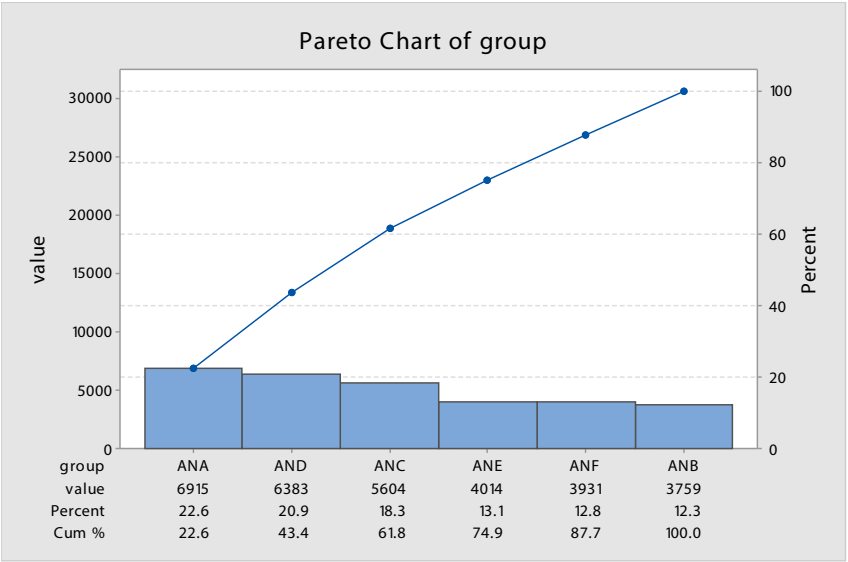


Figure 5. Pareto Interest Analysis

Improvement of UT services in services considered important by students is focused on three study programs consisting of PGSD, PGPAUD and Management. The effect of improving service quality for three students in the study program will greatly affect the percentage of UT academic improvement by 80%. The effect of this policy is very significant because of the large number of students served in PGSD, PGPAUD and Management study programs.



ANA = Distance learning and education models

ANB = Registration

ANC = Teaching Materials (modules and non-print teaching materials)

AND = Face-to-face tutorials and online tutorials

ANE = Learning assistance counseling services

ANF = Learning evaluation

Figure 6. Pareto Analysis for item of academic services

Figure 6 shows that 74.9% of UT's academic service problems are dominated by problems in (a) study program and distance learning; (b) face to face and online tutorials; (c) teaching material; and (d) counselling services and learning assistance. The results of the analysis with the Pareto chart in the learning service group showed a significant problem that occurred in the study group and distance learning service groups. Although in the BSC analysis the level of student satisfaction reached 91.05%, only 45% of the types of services were considered to have good performance by students. 18% of service types are considered not so important by students and have low performance. While 27% of the types of services, despite having high performance but are not considered important by students. 9% of the types of services in this group are considered important and require increased performance.

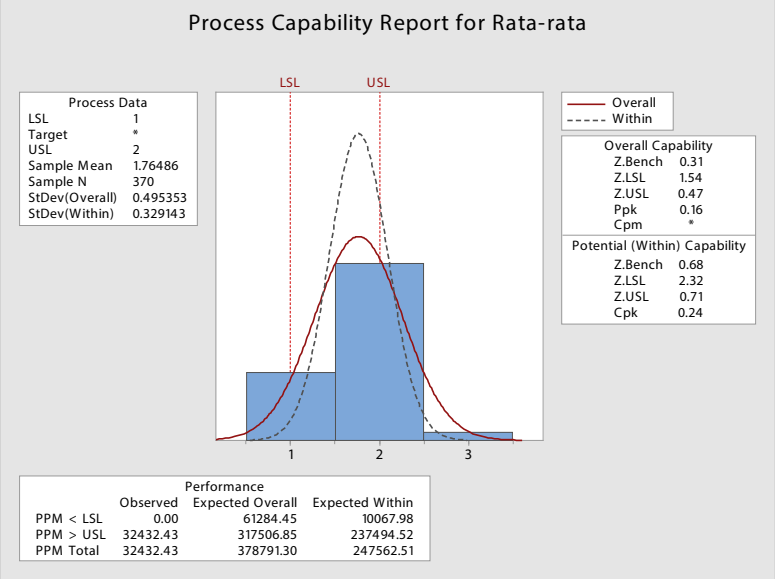


Figure 7. Process capability report for rata-rata

The subsequent analysis of the Six Sigma method is the analysis of process capability. Process capability is the ability of a process to produce a product/service in accordance with the needs/requirements of consumers or the specifications expected. Capability analysis is also used to find out a process running capable and produce products/services according to its specifications. The expected quality target is to increase process capability by reaching 3.4 DPMO in the production process. Figure 7 shows that the value of z.bench is 0.68, which means that the z.bench is still below 1. The value is below sigma capability 2.5σ or 1.7 sigma.

Table 2. Six Sigma Value Approach

Z.bench	Sigma Capability	PPM Defective	Level Sigma	Percentage without Defects	DPMO
1	2.5σ	158,655	± 1-sigma	30,9 %	691.462
2	3.5σ	22,750	± 2-sigma	69,2%	308.538
3	4.5σ	1,350	± 3-sigma	93,3%	66.807
4	5.5σ	32	± 4-sigma	99,4%	6.210
4.5	6.0σ	3.4	± 5-sigma	99,98%	233
			± 6-sigma	99,9997%	3,4

By looking at the comparison in Table 2, it can be seen that the performance of UT academic services is still not satisfactory. With a sigma level below 1, there are 70% of UT academic services that still need to be improved, because these services are not in accordance with the specified KPIs. Figure 7 also shows Cpk <1, so the process is said to be not capable and there needs to be an improvement in the process. The high level of errors in the delivery of academic services causes low student satisfaction.

DISCUSSION AND CONCLUSION

This research is preliminary research to build an integration between BSC and Six Sigma in improving academic service performance in distance education. The results of the analysis of UT academic services with BSC and Six Sigma show that the performance of UT academic services still needs to be improved. CSI analysis shows the level of student satisfaction is very high (90.16%), but the science analysis revealed 46% of the services provided were not in line with student expectations. This fact means that there are still many UT services that although they have high performance, they are not considered important services for students. The BSC has translated the organization's strategy into relevant organizational metrics in the form of Key Performance Indicators (KPI) and made measurements on the perspective of the BSC (Kaplan, 2001; Parmenter, 2010).

Analysis with Six Sigma states that UT's academic service level is at the level of sigma ability 2.5 σ or sigma level below 1 (one). This analysis means that 70% of UT's academic services must be improved by the specified KPIs. Analysis of six sigma by four stages Define, Measure, Analyze, Improve and Control (DMAIC) shows that services academic need attention, especially in (a) courses and distance learning; (B) face to face and online tutorials; (c) teaching materials; and (d) counselling and learning assistance services (Alastair, 2003). The Pareto analysis shows that service improvement must first be provided primarily for academic services in FKIP Basic Education students.

Measurement of organizational performance based on BSC analysis shows that some academic services still need improvement. Open Universities can choose service improvements that allow the most efficient use of time and resources and provide significant results for universities (Holmes, et.al., 2014). The six sigma approach provides detailed steps about what the organization must do to achieve the established performance (Pande et al., 2000). An increase in Six Sigma metrics to a higher level indicates a smaller level of a production error and an increase in production quality. If related to BSC, this increase can collectively influence the achievement of level indicators to a higher level.

Similar to the results of research conducted by Heavy and Murphy (2011) and Holmes (2014) the merging of BSC and six sigma performance measurement is very effective to describe the performance of Open University academic services. The BSC is an effective tool for translating strategies into high-level performance while six sigma provides the ability for organizations to control performance improvements systematically and measurably. The combination of BSC with Six Sigma will articulate and execute business strategies and will act as a platform for business excellence and continuous improvement (Heavy and Murphy (2011).

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DESIGN OF VIDEO AIDED RETENTION TOOL FOR THE HEALTH CARE PROFESSIONALS IN SELF-DIRECTED VIDEO-BASED LEARNING

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Received: 26/07/2020 **Accepted:** 10/06/2020

ABSTRACT

Health Care Professionals (HCPs) depend on self-directed learning by watching medical videos. In the traditional video learning system, it is difficult to identify the important videos from the huge data set and to find the essential inside parts of a long video. In addition, it is hard to know learners' preferences inside the video parts, including duration and repetition of watching. If the system could know the attention and retention process of each learner, it could change the way to show the video. Accordingly, this research proposes to design the Video Aided Retention Tool (VART) system for analyzing video content to improve self-directed video-based learning among HCPs. The VART consists of a combination of video tracking, analyzing, and filtering tools, with the integration of domain model, learners' model, and e-teaching strategy model to aid in self-directed learning. The proposed VART will pick important videos on a single topic and put automatic indexes to represent the essential parts of video content. It will also track the learner's ID, content preference, monitor watching duration, and repetition of the content. Using such kind of data, attention, and retention will be determined and filtered reels, recommendations, interactive videos will be provided to the learners.

Keywords: Video Aided Retention Tool (VART), Video-based Learning, Self-directed Learning, Adaptive Learning, Health Care Professionals (HCPs)

INTRODUCTION

Learning from video content received a great response from all kinds of learners since YouTube launched in the year 2005. Following the success story of YouTube, many other video channels, like TED, DTube, Dailymotion, Google Video, Yahoo Video, Vimeo, and some other video-sharing platforms emerged. Very recently, due to the COVID-19 situation, the whole world experienced a new era of communication methods, especially most of the teaching and learning methods moved online with a diverse communication style. Watching video streaming from various video-sharing platforms as well as institutional videos on the web, have become one of the important parts of the teaching and learning process. But determining learning outcomes from video content is difficult especially in self-directed learning. Yuzer, Firat, & Dincer (2016) study suggested that there should be learning analytics tools for educators as well as learners for analyzing learning outcomes from a learner's interaction with every medium of content. In this case, video content again received significant attention from the teaching and learning communities. Most importantly, due

to the COVID-19 situation, there has been strong pressure on the Health Care Professionals (HCPs). As a result, they are one step ahead than any other community in the case of online teaching, learning, and communicating with patients, co-workers, and others. Another critical issue for the HCPs is the clinical decision-making at the right time to ensure proper treatment and to save the lives of the patients. So, clinical decision-making is considered as a foundation of effective medical education and a significant criterion of the physicians' competency. HCPs need to deal with different critical situations and make the decision in a complex environment during their daily duties. For this, very often, they rely on self-directed learning by watching medical videos available on the web.

Park & Park (2016) stated that clinical practice-related videos have triggered HCPs' interests and help them to learn major medical subjects. However, the learning process based on only watching the videos may not be effective until learners can remember, reflect, and use it in a real situation (Hasegawa & Dai, 2015). Besides, HCPs have a very tight schedule, but the video resources are enormous and there are several videos on the same topic. However, they want to pick the most important video based on their skills and competency level. In addition, in the case of long videos, generally, multiple topics are included, and it is difficult to pay concentration for a long video. So, it is needed to identify the vital parts of the video because learners may not need to watch the whole video, and that is time-consuming.

Moreover, in the traditional video learning system, it is difficult to determine which part of the video did the learner focus, including the duration and repetition of watching and their expected video contents one after another. In that case, if the system could know the attention and retention process of each learner, it could change the way to show the video. Considering these issues, this research proposed Video Aided Retention Tool (VART) which will track and analyze learner's video watching characteristics that include learner's content preferences, learning process, learning progress, etc. and filter and provide focused contents for effective learning.

However, this paper is an extension of the authors' previous research Video Aided Retention Tool for enhancing decision-making skills among Health Care Professionals (Sagorika & Hasegawa, 2019). In the previous research, the authors discussed the decision-making cultivation cycle among HCPs, VART integration with Moodle, and VART framework. In this research, the researchers introduce the design phase of the domain model, learner's model, and e-teaching strategy model with the integration of VART.

RESEARCH PROBLEMS

Based on the previous research, this study identified several problems that triggered designing VART for HCPs. The core problems include:

1. **Diversified content:** In the field of healthcare and medical learning, there are numerous clinical video contents available on the web. At the same time, there are a variety of video contents available on the same topic in different sources. But HCPs have a hectic schedule, and they want to pick the important videos quickly. So, how to support HCPs to determine the expected video contents from the huge data set is very important.
2. **Content specification:** Many clinical videos have long contents consisting of several topics together. Besides, in long video content, all parts are not equally important for a certain learner. As HCPs do not have enough time to watch the whole video; it is also difficult for them to pay attention to a long video. HCPs want to pick the most critical parts first. If they find the video is essential for them, they can learn profoundly using the whole video. So how to make a summary video from the huge video data, or how to filter essential parts from long video content and represent based on learner's demand is one of the targets for HCPs to support using the video.
3. **Learning behavior:** HCPs have different knowledge levels and learning behaviors. Very often, it is difficult for them to select the right video content based on their competency level and learning progress. However, most of the systems do not have a clear description of providing content based on learner's competency level and learning progress. Furthermore, there is no technique to follow the cognitive behavior of a learner to know his/her learning process and how to assist the learner in that process.

RESEARCH OBJECTIVES

To overcome the above problems, the objectives of this research follows to:

i. find out the mechanism of identifying expected video contents, represent the essential parts inside the videos and filter content based on learner's learning process and progress in the self-directed video-based learning;
ii. illustrate VART functional overview through indexing essential parts, fractioning long videos into specific parts, and matching video content with learner's competency level and way of learning; and
iii. apply the VART technique into the domain model, student model, and e-teaching strategy model to design for video-based learning.

RELATED LITERATURE

Different researchers have emphasized Video-based teaching and learning strategies from different perspectives. Among some important research, Kilinc, Firat, & Yuzer (2017) study examined the usages trends of educational videos in distance learning environments, Jang & Kim (2014) investigated the students' usages and perception of online clinical videos for learning clinical skills; Clifton & Mann (2011) suggested using YouTube for teaching and learning among nurses; Park & Park (2016) remarked anatomy and pathology to be taught with video-assisted technology and, Friedl et al. (2006) and Pape-Koehler et al. (2013)training, and concentration. In recent years, Internet platforms providing surgical content have been established. Used as a surgical training method, the effect of multimedia-based training on practical surgical skills has not yet been evaluated. This study aimed to evaluate the effect of multimedia-based training on surgical performance.\\n\\nMETHODS: A 2 × 2 factorial, randomized controlled trial with a pre- and posttest design was used to test the effect of multimedia-based training in addition to or without practical training on 70 participants in four groups defined by the intervention used: multimedia-based training, practical training, and combination training (multimedia-based training + practical training found the effectiveness of audio-visual contents in surgery education among medical students. In addition, Weeks & Horan, (2013) found that activity and learning based on the video- resources were effective for physiotherapy students in practical examinations and it improved their performance level. Also learning from the video contents for surgical groundwork becomes a very important and regular practice among the specialist doctors in Portugal (Mota et al., 2018)teaching of surgery has remained practically unaltered until now. With the dawn of video-assisted laparoscopy, surgery has faced new technical and learning challenges. Due to technological advances, from Internet access to portable electronic devices, the use of online resources is part of the educational armamentarium. In this respect, videos have already proven to be effective and useful, however the best way to benefit from these tools is still not clearly defined. Aims: To assess the importance of video-based learning, using an electronic questionnaire applied to residents and specialists of different surgical fields. Methods: Importance of video-based learning was assessed in a sample of 141 subjects, using a questionnaire distributed by a GoogleDoc online form. Results: We found that 98.6% of the respondents have already used videos to prepare for surgery. When comparing video sources by formation status, residents were found to use Youtube significantly more often than specialists ($p < 0.001$.

However, the volume of effective research on educational videos used in the e-learning environment is very limited (Kilinc et al., 2017). Besides, it is tough to gather the intuitions of the learners from various video learning practices and logically contribute to the creation of a joint framework for video-based learning (M. N. Giannakos, et al., 2013). The study investigated the usefulness of video analysis by combining learners' interaction information with the video-based courses and how to support instructors with the suitable contents to improve the usage of their courses (M. Giannakos, et al., 2014). Another research proposed a new cross-modal recommendation method based on multi-modal deep learning for the multi-modal video contents depending on learners' preference for video data (Yang, Xie, & Li, 2019).

Very recently, Nazari et al. (2020)the step-by-step group will perceive lower extraneous load during the preparation of the surgical procedure compared to the continuous group. Subsequently, fewer errors will be made in the surgical performance assessment by the step-by-step group, resulting in better surgical

performance. DESIGN: In this prospective study, participants were randomly assigned to the step-by-step or continuous video-demonstration. They completed questionnaires regarding perceived cognitive load during preparation (10-point Likert scale found that step-by-step video-based learning results in lower cognitive load and fewer procedural errors than the continuous video-demonstration during the surgical actions among the medical students. Delen, Liew, & Willson (2014)this study investigated the effects of a newly designed enhanced video learning environment, which was designed to support or scaffold students' self-regulated or self-directed learning on students' learning behaviors and outcomes. In addition, correspondence between students' self-regulation strategies in traditional learning environments and observed self-regulated learning behaviors in the enhanced video environment were examined. A cross-sectional experimental research design with systematic random assignment of participants to either the control condition (common video study examined learners' self-directed learning behaviors in online video-based learning using 'common videos' with micro-level functions in the traditional method and 'enhanced videos' included macro-level with the micro-level functions in the experimental method. The study found that an enhanced video learning environment was accepted as a higher instructional tool than the common videos in terms of learners' learning outcomes. So, it is assumed that there needs learner's centered video learning support to fulfill their target in the self-directed video-based learning.

Studies also found that teachers and learners can reflect their own teaching and learning experience with the support of video annotation or video analysis tools (Rich, Hannafin, & Rich, 2010). Some video annotation tools, for example, VideoAnt or EVA, allows users to make a list of comments in the video parts. Another tool called OVA, provide a platform which enables analysis and collaborative discussion on the topics illustrated in the video and allows learners to share comments with each other (Cebrian-de-la-Serna, M; Bartolome-Pina, 2015; Perez-Torregrosa, Diaz-Martin, & Ibanez-Cubillas, 2017). Wang, Lin, Han, & Spector (2020) study used the Tobii X120 remote eye tracker tool to track the students' eye movements to know the watching duration and their attention to the added cues on the short instructional videos. Results found that students had more concentration on the areas focusing on cues in the videos and they performed better with the retention tests and assimilating necessary information.

From the review of existing literature, the researchers revealed that, though several types of research discussed on video-based learning, support systems, and tools, no research has been focused on the essential inside parts with the meaning of video content and providing content based on learners' attention and retention viewpoint along with analyzing video watching history and most watching parts. This research aims to fill this gap.

In addition, usual YouTube and traditional systems use overall watching history and general tags for videos and recommend similar videos. However, they do not analyze and consider deeply inside the video contents and do not consider the learner's learning process and progress point of view. In this case, VART has the potential to find learners' specific interests and unique support for them in the self-directed video learning environment.

PROPOSED METHOD

The main research will follow the five phases of the ADDIE model from the beginning to the end of the task as a framework in analyzing, designing, developing, implementing, and evaluating the VART system in the proposed platform. For the scope of the study in this paper, we have followed the design method based on the analyzed problem from HCPs' video learning characteristics and demand. However in the design method, we have defined the requirements of the system/functions to be developed to resolve the problems. In this design phase, the research has provided the design structure/architecture of the five conceptual models for VART. The models are i) VART overview model ii) domain model, iii) learners' model, iv) e-teaching strategy model, and finally v) integrated VART function model with the domain model, learner's model, and e-teaching strategy model in the LMS.

PROPOSED SOLUTION

Based on the available literature and the statement of problems, this study draws some tentative solutions. Table 1 describes how to address the research problems followed by proposing the VART system.

Table 1. VART problem-solving approach

Problems	Solution Method	Tentative Model	Final Model
Diversified content: Numerous video contents, a variety of contents on the same topic.	Tracking viewing history of previous learners, Analyzing focused part, sequencing video content	Learners' model	VART
Content specification: Long video, busy schedule, learners' concentration.	Analyzing video content and fraction of content	Automatic indexing in the domain model	
Learning behavior: Different learning process and progress among learners.	Analyzing the attention and retention of the learning process	Learners' model & e-teaching strategy model	

The VART is one of the latest tools which can instantly conduct content moderation across a huge amount of data and filter a user's viewing history and preferences very quickly and efficiently to aid in self-directed video-based learning (Sagorika & Hasegawa, 2019). It can also detect the more specific parts inside the videos and put the automatic indexes or tags to represent the contents in a specific and meaningful way.

How VART Works

1. **Investigate of learners' interest:** The research has proposed the VART technique which can pick important videos from the huge data set. The VART analyzes significant attention and retention parts from the learning scenario, learning history from previous learners and pick up the important video sequence from the huge data set or different video sources and provide HCPs as a brief description. If learners feel, they need video contents, they can go through the actual learning resources.
2. **Analyzing content:** Many video service platforms including YouTube, provide viewing history of a certain video. However, only history data is not enough, because HCPs need to know not only about the video but also the essential parts inside the video. Besides, HCPs have different competency levels and learning behaviors too.

   In this case, the VART approach is to combine the domain hierarchy information, previous learner's video watching information, and add indexes, tags, or metadata for videos. The proposed VART can detect the number of the watching history of video content and time of the watching history of the specific part of the video, for example, the part of the watching history from 2 minutes to 5 minutes, etc. So, only such history data may be a popular part of the video, but if we add some indexes, tags, or metadata for inside video contents, learners can find the meaning of video content. For example, this popular part has this kind of content, i.e. from 2-4 minutes, the introduction of COVID-19, 4-10 mins precaution exercise, or something. If we have such indexes for videos, not video files, but tags for each timeline inside videos, users can easily understand the essential parts with the meaning. One of the strong points is the VART function with automatic indexes to detect the more specific parts inside the videos and put automatic indexes or tags to represent the contents in a specific and meaningful way. So, these functions are included in the domain model with the help of VART which we discussed in the Domain model section.

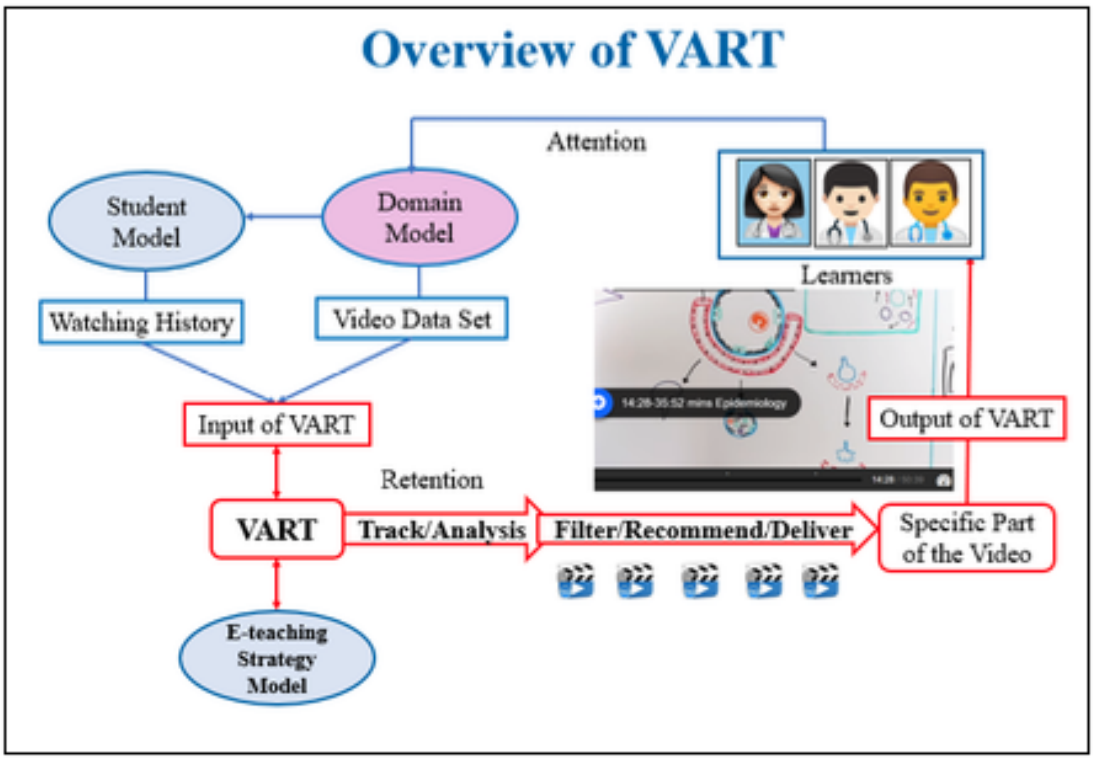

Figure 1. Overview of the VART Model

In figure 1, we have represented the main elements and final output of the VART system. As input data, VART uses video data set and learners' watching history from the domain model and learner's model. After that, it tracks and analyzes videos based on the learner's attention and retention process. In this figure, attention indicates learner's choices or preferred topics or expected parts inside the videos, and retention indicates the remembering process or learning process of a learner. However, after analyzing the input data it filters, recommends, and delivers specific content to the learners considering different strategies. The detailed functions are described in the components of the VART section.

3. **Tracking learner's behavior:** In the proposed platform, the VART will first detect each learner's ID and then track what type of contents they are seeking; this is called attention. At the same time, it will follow the learner's learning duration and repetition of watching, their comments, their weakness, or intentions, which is considered as retention or remembering process. The approach is that, if the system could know the tendency of each learner, someone focuses on the first part of the video, other focus on the middle or, last part, or all of them. Based on such a learning process and progress, the system could change the way to show the video.

Thus, the system can recommend which part is essential using such watching characteristics, attention, and retention process. Accordingly, it can filter contents based on learners' preferences, learning behavior, and competency level, which we consider as learners' models and suggest/provide the expected videos, which we consider as an e-teaching strategy model for this system.

COMPONENTS OF VART

Based on the above discussion, how to create such kind of domain information to the videos and how to analyze the videos and how to provide the support for the learners with the support of VART, these three parts are considered as the main functions for this paper. We explain these primary functions to clarify the design phase of the domain or video model, student model, e-teaching strategy model, and relationship with VART with these three models."

Domain Model

The Domain Model is an organized and structured knowledge of a given course, subject, topic, or problem. In some literature, domain models are also described as domain hierarchy, expert model, knowledge model, target model, etc. (Abdelsalam, 2014). A traditional domain model generally uses the vocabulary of the domain and represents the key concepts of the specific domain and identifies the relationships among all the entities within the scope of the domain. Simply this kind of domain model introduces a visual representation of the contents and their inter-relationship, which helps learners to easily navigate their desired subject, topics or learning objects, etc. (Brown, 2014).

In the proposed domain model, different types of medical courses could be designed and structured based on the learning requirements of the HCPs. In the traditional video domain, video contents are arranged by different subjects, and topics and contents are displayed sequentially one after another. Generally, it focuses on video content management and control. However, in the proposed domain model, it has the traditional features with extended features of VART, which made the video content more specific and learners centered. These features include the content moderation process among a huge amount of data, control inside of the video, provide adaptation with the uses of indexes to identify important parts with meaning, along with the track, analyze, filter, and recommendation attribute based on learner's requirements. Moreover, we use the H5P interactive content plugin integrated with the Moodle to create, modify, rich and interactive video contents in the domain ("H5P," n.d.). However, we have designed a sample domain or content model based on the main course COVID-19, since this is the ongoing emergency topic for the HCPs as well as all the people over the world at this moment. In our proposed system, VART relates to the domain model through Moodle LMS. In the medical and healthcare field there are huge video resources on the web. So, VART first analyzes learning history from previous learners and significant attention and retention part from the learning scenario and picks up the important video sequence from a huge data set and represents the video with a brief description. So before watching the whole video, HCPs can decide whether the video is important or not, and it saves time. The VART also analyzes inside the video contents and identifies important parts in each video and puts automatic indexes or tags so that learners can easily pick up the most important part first. There are some approaches to put automatic indexes inside the video. For example, VART can apply the Natural Language Processing (NLP) to automatically detect the rough contents to get keywords from the slide data used in the videos, and title and subtitle of the video, and can create some basic meta-data for each video part. Another function is if learners make comments for the video, the system can detect such text data as a part of the indexing to provide the meaning of that content. However, figure 1 shows the VART connection with the domain hierarchy and at the bottom level shows how it represents the short description of the video and how it analyzes and represents important parts in single video content. Detail description is given in figure 2, and in images 1 and 2.

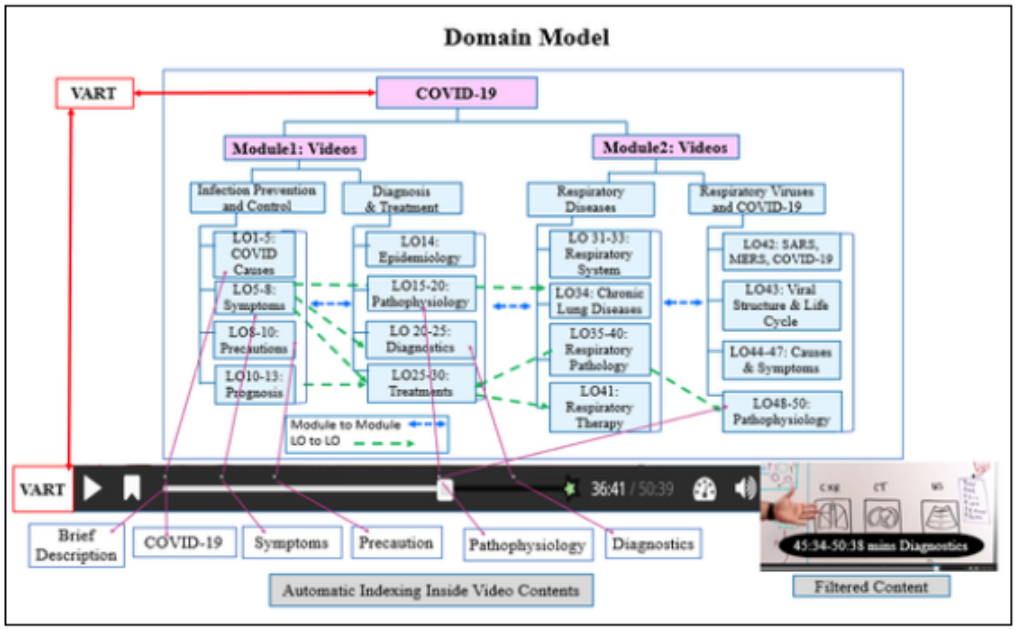

Figure 2. Domain Model

Figure 2 also shows that, in the domain model, there may have different domain hierarchy based on different subjects or topics. However, in the case of self-directed video-based learning, HCPs should have enough flexibility in their learning. They can choose different topics and sub-topics which are known as Learning Objects (LO) from different modules as they wish. For example, any HCP can learn the 'causes' and 'symptoms' of COVID-19 and then move to any module and any topic they like. In the domain hierarchy, contents are inter-related with module to module and LO to LO. The blue arrows show the connection among the module to module, and the green arrow shows the connection among LO to LO. In the VART supported domain model, the video contents summary is provided along with the duration of each fraction. So, learners can easily choose their desired parts for view.

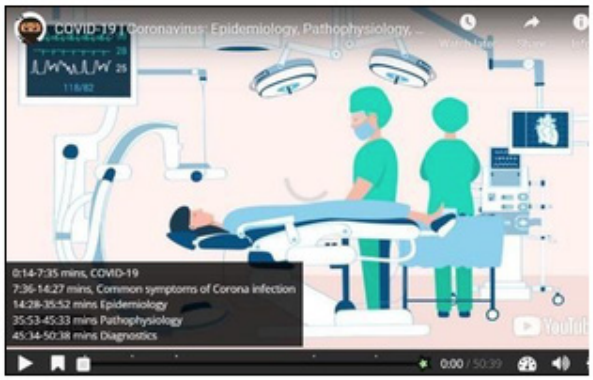

Image 1. Brief description of the video

Image 2. Automatic indexing inside video

Source: *(Nerds, 2020)*

Image 1 shows a brief description of 50 minutes and a 39-second video at the beginning with the essential parts of the video. Image 2 shows the sample automatic indexing representation inside the video with meaning and time duration. So, it is easy for the learners to determine whether the video is important or not and what are the essential topics available inside a long video.

Learners' Model

Modeling users in e-learning is an essential part of designing adaptive e-learning systems. Shyamala, Sunitha, & Aghila (2011) stated that the learner model is used to modify the intersection between system and learners to suit the needs of individual learners. In principle, effective learners' modeling helps to select suitable teaching strategies based on learners' knowledge as well as selecting content relevant to learners' competency. Learners' model serves as a knowledge source in an intelligent system covering different aspects of learners relevant to learners' learning behavior. More specifically, the learners' model represents information on learner's domain knowledge, goals, preferences learning process, learner's progress, and other information about the learners. This information can be obtained from the learner's profile and a pre-assessment questionnaire filled by the learner at the beginning and tracking and analyzing learner's activities in the system.

There are different approaches to designing learners' models in an e-learning system. However, three conventional approaches are an overlay model, stereotypic model, and the perturbation model. The overlay model represents a student's problem-solving approach in a particular domain on a modular basis. Brusilovsky & Millan (2007) stated that the overlay learners model represents learners' model as a subset of the domain/ expert knowledge. Shyamala et al. (2011) described that based on the domain model learners model consists of the value of an assessment module of a particular concept. This value may be binary (0 – does not know or 1 - know) and a categorical variable (low, medium, high).

On the other hand, the stereotypic of learners modeling represents a frequently occurring behavior of learners. In this approach, learners are assessed based on their performance on a predefined stereotype set by academic experts (fixed stereotype), or learners are stereotyped to a default initial setting, and the learning process proceeds to replace individualized settings based on performance data. In the perturbation or buggy approach, the learner model caters to the knowledge possessed by the learner that is not present in the expert domain knowledge (Brusilovsky & Millan, 2007).

Based on the learning style of HCPs, this study designed a learner's model following overlay approaches. Figure 3 illustrates the learners' model of the HCPs.

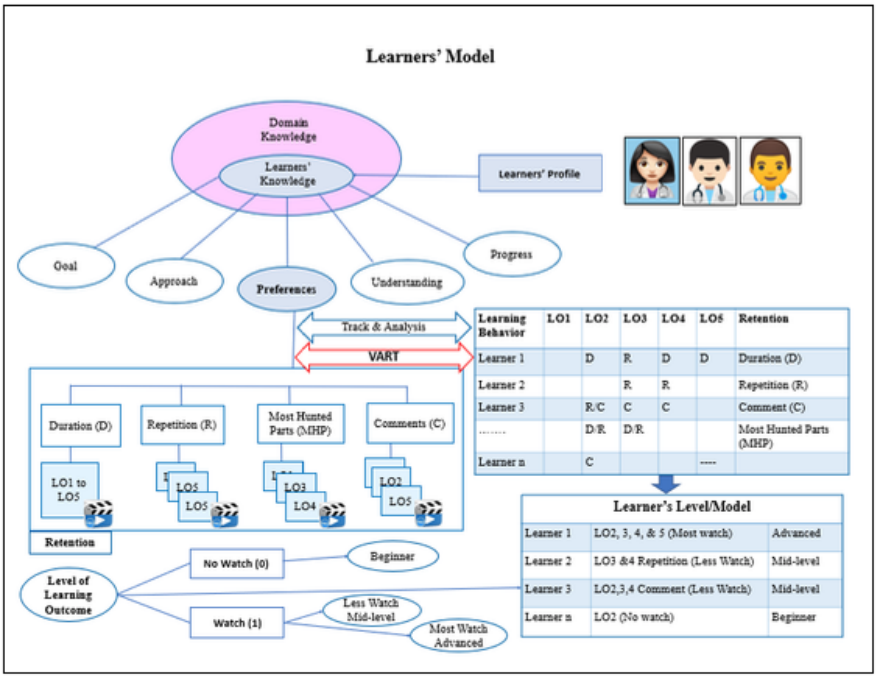

Figure 3. Learners' Model

HCPs have different backgrounds, goals, approaches, preferences, understanding, etc. Based on the preference, HCPs may watch some videos from the domain as retention and system get the learner's model based on watching duration, repetition, most watching parts or comments, etc. This is considered as learner's behavior on the Learning Objects (LO). The learners' model basically indicates the relationship between the domain model and the learner's activities. In figure 2, on the upper table, there are five learning objects, and how learners watch these objects is a retention process. Image 3 and 4 are the visual examples of learners' retention process. This process could be applicable for a certain learner or other learners or groups of learners; for example, 'the watching duration'. One learner may watch LO1 10 minutes, LO2 0 mins, LO3, 0 mins, LO4, 5 minutes something like that. Other learners may watch in a different way. Based on learners' preference system can recommend the next videos.

Besides, the level of learning outcome is determined on whether HCPs watch a particular video or not. If any HCPs do not watch a certain video, VART will identify him/her as a beginner, if someone watches the video, VART system will calculate total number of watching videos, watching duration, repetition, important parts and will identify as a mid-level or advanced learner.

However, image 3 shows the visualization of a single learner's retention history on a five minutes video. The learner watched the video twice. The blue arrows on the top indicate the learner's most hunted parts, repetition of watching and duration of watching, and arrows at the bottom level shows the detail watching fluctuation history of the learner. Image 4 shows the visualization of a group of learner's retention history on a hundred minutes video. The blue arrows indicate the most preferred or most important parts watched by the learners in the video.

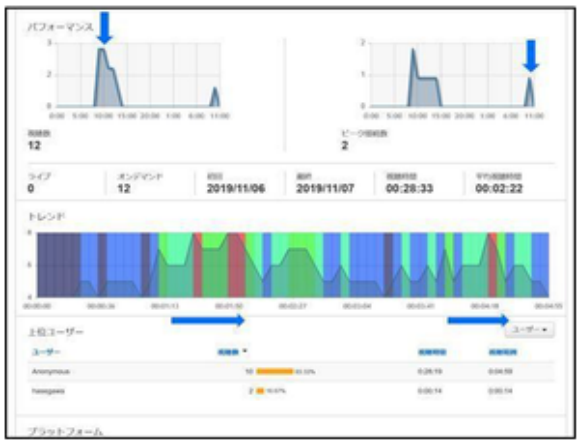

Image 3. Visualization of retention: single viewer

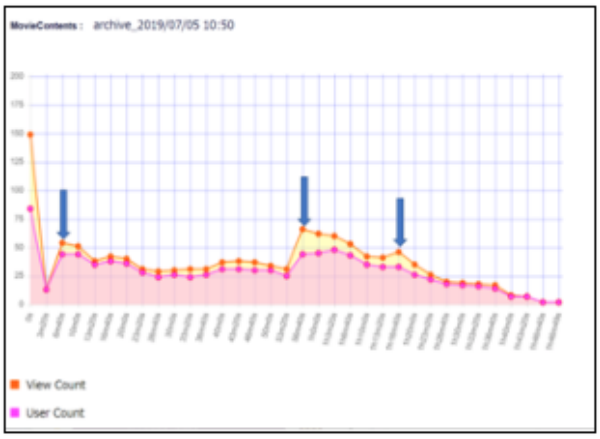

Image 4. Visualization of retention: group viewers

Source: *("Lecture Archive, JAIST LMS," 2020)*

E-Teaching Strategy Model

The e-teaching strategy model represents the teacher's or instructors' plan on how to represent and teach each topic to the learners in an easy and understandable manner. Different teachers may have different teaching strategies, or teachers can apply different strategies to teach the same concept based on the learner's diverse characteristics and learning needs (El Bachari, Abelwahed, & El Adnani, 2012). In the proposed system, the e-teaching strategy method is determined based on the combination of learners' model and domain model data and depending on the characteristics and learning behavior of the HCPs in the self-directed video-based learning. The VART system will combine HCPs' watching history data including content preferences, watching duration, repetition, most important or most hunted parts, and other information from the learners' model and domain model and decide the proper recommendation. So, the system can propose different strategies combining different parameters; for example, contents preference, and most hunted part, content preference, and watching duration, watching duration and most hunted part, most hunted part and repetition of the video or less watching and no watching, etc. The e-teaching strategy model of VART is illustrated in figure 4.

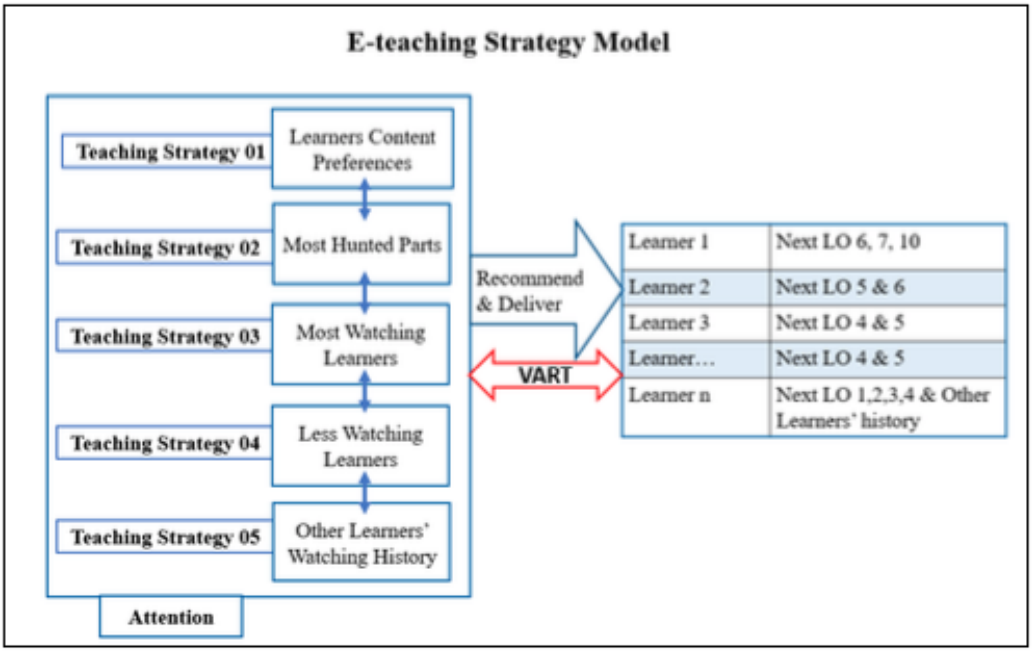

Figure 4. E-teaching Strategy Model

In the e-teaching strategy model, the system will provide mainly five approaches to the recommendation. Figure 4 shows, (i) it will receive learner's content preferences data, (ii) most hunted parts, (iii) most watching learner, and (iv) less watching learner's data. Based on these different characteristics and attention approaches, it will filter or recommend and deliver different content to the different learners depending on their levels. The fourth approach is to use other learners' information. If a similar level of other learners watches a certain part in the video, the system will recommend it. For example, everyone watches LO4, but the certain beginner did not watch LO4, in that case, LO4 should be recommended to that learner. If in case, for some content, there is no other learner's data, in that case, the system can recommend based on learner's preference data. Another example is, if some learners are specialists or advanced learners for COVID-19, they can skip the COVID-19 basic contents. If others watch many times, but if they are specialists, they can skip it.

PROPOSED INTEGRATED VART FUNCTION MODEL

Figure 5 represents the integration of VART functions with different models on the LMS. The VART model has a three layers structure, including the domain model, learners' model, and e-teaching strategy model. With the assistance of VART, the domain model displays the important contents, important parts with the meaning of the videos, and learners watch some videos as retention and system get the learners' model based on the duration or repetition or comments or other information. This is considered the learners' behavior on the learning objects. The VART also assists the e-teaching strategy model to receive and combine data from the learners' model and the domain model and know the learner's attention and retention process. Accordingly, it proposes strategies, using the parameters on learners' model and learning objects. Thus, figure 4 demonstrates that the three models are included inside the VART, and the learning process from LO to the learners is retention, and system filters or recommend the contents add attention. Hence, these functions are major VART functions and are a part of the LMS.

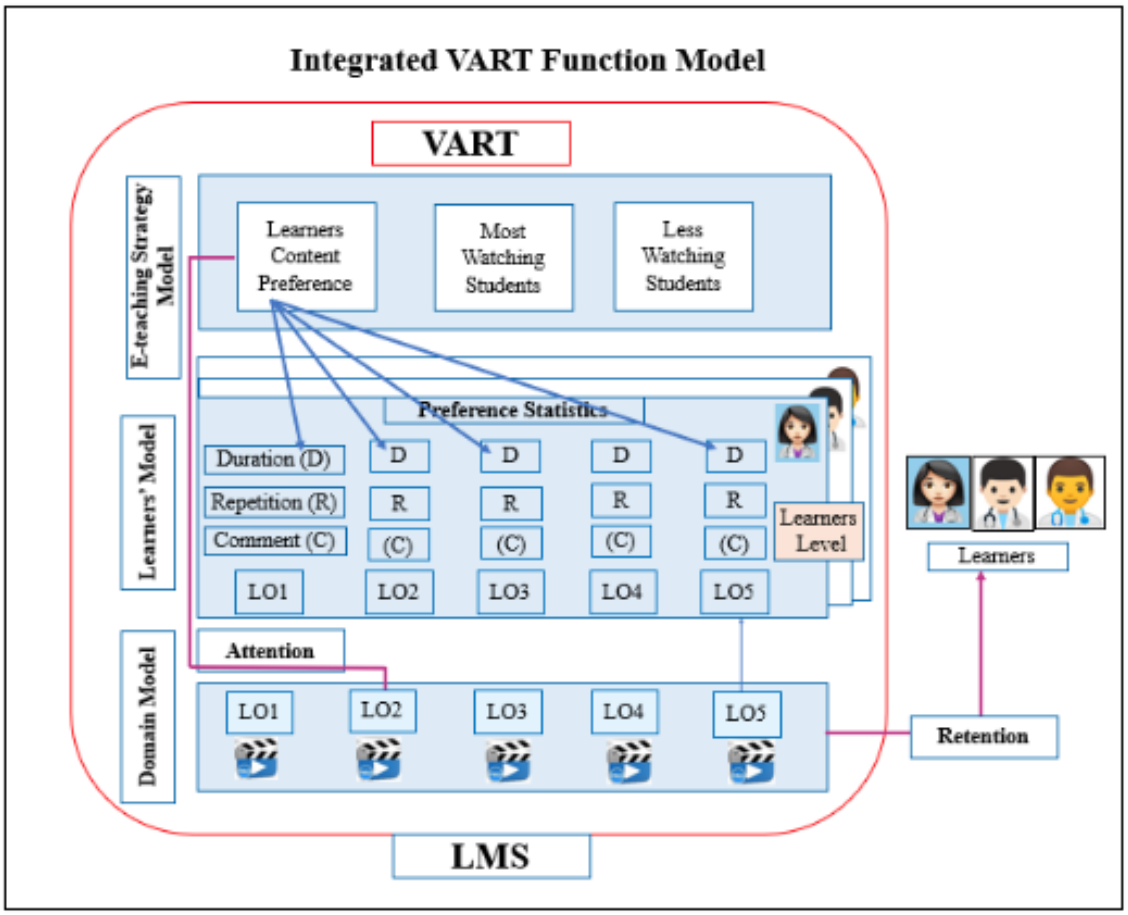

Figure 5. Integrated VART Function Model

CONCLUSION

The learning process, based on simply watching the videos, is too general and cannot fulfill the learning requirements in the modern video-based learning environment. To meet the diverse needs of the HCPs and save their time in video-based learning, they need a learner's centered video watching mechanism. In addition, there are a variety of video contents on the same topic in different sources. Most of the existing web-based video content indexes are equipped with What To Learn (WTL) point of view but not How To Learn (HTL) point of view (Hasegawa, Kashihara, & Toyoda, 2003). Accordingly, this research proposed VART which will track users' video seeking and usage trends and provide appropriate video content. To achieve the scope of this study, we have proposed three models as follows: the domain model integrated with the VART systems will represent the content hierarchy of each video content, show the important videos on a certain topic, and represent the essential parts inside the video with meaningful indexes. As a result, HCPs will be able to find their expected contents within a short time and pick the important parts inside the video quickly. The Learner's model addressed in the VART will represent the retention process of each learner and his/her learning behavior on the learning objects, which will lead to estimate the level of the learner and create the learner's model. The e-teaching strategy model deals with the attention or preferences data from the learners' model and domain model and proposes recommendations for each learner. So, learners' model and e-teaching strategy model will assist learners based on their learning process and progress and provide adaptation in the self-driven video-based learning system. Hence, the VART function includes three models, and, in the retention process, the system makes the learner's model, and in the attention process, learners use the strategy model and the domain model is the base of the system. Finally, VART functions, including all models, are part of LMS.

FUTURE WORK

In this study, the proposed VART model is designed based on the theoretical framework of different conceptual models as well as the learning behavior of HCPs. Now, the research will develop the actual VART framework, including implementation guidelines. In doing so, the researchers will follow the ADDIE model for the actual implementation. The researchers will also customize the Moodle platform for the adoption and implementation of VART. After the successful implementation, the research will collect system-generated output for the evaluation of the proposed model. The finding of the development and implementation phase, along with difficulties faced and other issues, will be presented in the next paper.

In addition, the final model will include more adaptive features so that it could easily incorporate with other video-based teaching and learning systems. For example, the VART model could be used for enhancing disaster survival skills among international students or creating adaptive video-based learning support for delivering content from university lecture archiving systems. In this case, the target learners are different, their way of learning and teaching strategy may have some additional requirement with the common features. So, one of the next targets is to modify the VART system based on such kind of requirements and make it more flexible to support any kind of video-based teaching-learning platform including different types of video-based distance learning systems.

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FROM MEDIA LITERACY TO NEW MEDIA LITERACY: A LENS INTO OPEN AND DISTANCE LEARNING CONTEXT

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Received: 14/11/2019 **Accepted:** 09/06/2020

ABSTRACT

Media literacy, which traditionally aims to help individuals become better-informed users through proper consumption of media messages, has historically been reshaped to reflect the characteristics of the tools that individuals utilize to consume such messages. Information and Communication Tools (ICT) developed in the 21st century, also referred to as the Digital Age, have enabled individuals to become producers of media messages in addition to consumers. Therefore, there has been a need for empirical studies into the concept of media literacy that has evolved into new media literacy with the impact of these new participatory and connective technologies. Within this regard, this study seeks to investigate the new media literacy levels of open and distance learners who primarily depend on ICT to access tertiary education. Besides, the study examines the relationship between demographic information of learners and their new media literacy skills.

Keywords: Media literacy, new media literacy, digital literacies, open and distance learning, online learning.

INTRODUCTION

Media, in the most general sense, refers to the mass communication tools and platforms. Media literacy, on the other hand, focuses on the utility of media messages including audio-visual and printed content via comprehension, analysis and critique of such messages (Buckingam, 2007). In this respect, media literacy comprises a set of multi-faceted skills that highlight the skills used by individuals to not only consume but also critically analyze what they have viewed, heard or read on the media platforms. Moreover, other key media literacy skills today include the production of self-generated content along with access, comprehension and critiquing skills.

Media literacy traditionally aims to help individuals become better-informed users through proper consumption of media messages, which underscores a critical evaluation of media content by individuals (Scheibe, 2009). However, while the concept of media literacy emphasizes the role of the better-informed consumer of media messages, it falls short of encompassing the critical skills for individuals to actively produce and share self-generated media messages. Several factors including the rapid development of ICT, the blurring of the lines between time, place and tools for communication purposes, the transition from the industrial society to the digital (Christensen & Tufte, 2010) as well as the evolution of web successively from 1.0, 2.0, 3.0 and now 4.0 which has added further characteristics into media tools and platforms have all contributed to the development of new dimensions for media literacy skills. Individuals extensively utilizing the new internet and social media tools in this age make use of newer sets of media skills required to function in these platforms such that today not only authority figures such as website owners or administrators but also "common folk" once holding the role of the consumer has gained the required tools to produce and publish content that reflect their own opinions, values and ideologies, which has blurred the distinctions between the sender and the receiver ends of the communication chain. All these technological and societal pressures require the reconceptualization of media literacies to include the new sets of skills that individuals make use of while functioning on the new media platforms which has become both popular and indispensable for the society today (Erstad, 2010). For these reasons, this study seeks to investigate the new media literacy levels of open and distance learners who primarily depend on ICT to access tertiary education. Besides, the study examines the relationship between demographic information of learners and their new media literacy skills.

NEW MEDIA LITERACY

The concept of new media which encompasses notions including digital interaction, creative and collective participation, connectivity, modularity, hybridity, data manipulation and virtuality represents technology-based socio-cultural platforms on which a given message is both created and distributed digitally by a given member of society. Within this respect, new media subsumes an information processing ecosystem in which digital messages are not only created but also accessed anytime, anywhere via any digital device (Chen, Wu & Wang, 2011).

With the advent of Web 2.0 as an offset of the developing internet technologies, new media literacy has been attracting attention. Web 2.0 tools including but not restricted to internet-based social media platforms, blogs, wikis and RSS feeds hosts the power to facilitate production and distribution of knowledge on a global scale. The traditional approach to media literacy has undergone a transformation with Web 2.0 in such ways to expand to include "produce" and "distribute" skills as well as the traditional "access" and "consume". Therefore, the new media literacy framework highlights the interaction of individuals with others not only through consumption but also through production and distribution, which further allows the active participation in and co-production of media messages (Koc & Barut, 2016). This collective process has also made it easier for individuals to share opinions and views. The developments experienced in the digital age has brought the production skills of individuals along with those of consumption to the fore. Thus, the concept of new media literacy, as a new phenomenon, refers to production, distribution and consumption of media messages via information and communication technologies through blending technical know-how and socio-cultural factors (Lin, Li, Deng & Lee, 2013, p. 161).

The new outlook on the concept of new media necessitates mapping the boundaries of what entails to be "new media literate". For this reason, depending on the definitions and conceptualizations in the literature a new framework has been proposed (Chen et al., 2011; Lin et al., 2013; Lee et al., 2015). The framework developed by Chen et al. (2011) situates production in its focus in addition to consumption. Therefore, the new framework incorporates both the consumption skills which are regarded as sets of skills to access and use media messages with the help of various technical skills, and production skills with the advent and widespread use of Web 2.0 tools. This fundamental change in individuals' interaction with the media has made them both the consumer and the producer of such messages. In addition, Chen et al. (2011) has incorporated into the frame critical literacy skills referring to the awareness into both subtle and overt messages through analysis, evaluation and critique of media messages along with the traditional technical skills. (Chen et al., 2011). Lin et al. (2013) have revisited the framework and redrawn the boundaries of

functional prosuming and consuming along with critical prosuming and consuming skills to compose the new media literacy skills, thereby proposing four sets of skills along functionality and criticality lenses (Lin et al., 2013, p. 165-166).

This study adopts the new media literacy framework developed by Lin et al. (2013) with Web 2.0 tools in mind and empirically tested by Lee et al. (2015) to investigate the new media literacy levels of open and distance learners. According to this framework, new media literacy is composed of four sets of skills including functional consumption (FC), critical consumption (CC), functional prosuming (FP), and finally critical prosuming (CP). Figure 1 shows the framework.

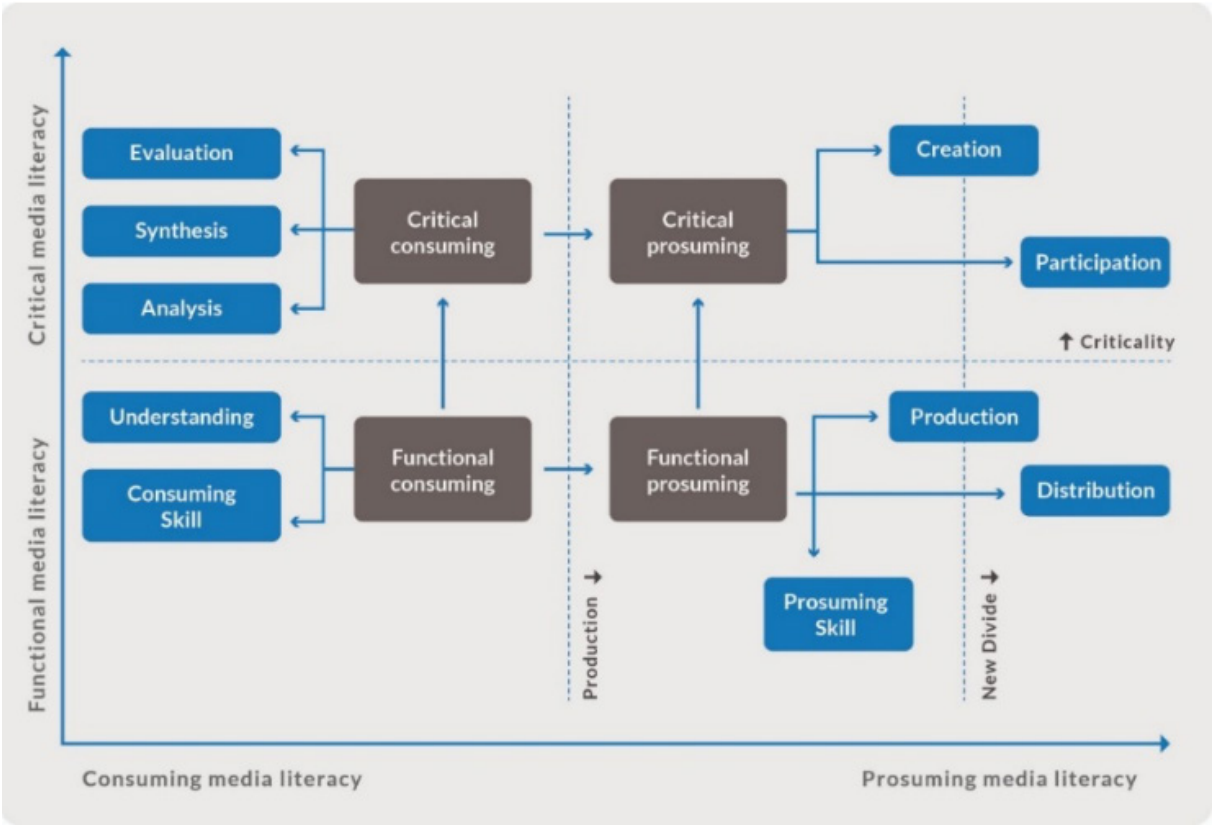

Figure 1. New Media Literacy Framework (Lin et al., 2013, p.163)

Functional consumption encompasses not only the technical know-how that individuals require to access and utilize media messages but also the skills required to make sense of these messages. Examples of this skills include individuals' use of computers to access information, search using search engines, and understand others' opinions located in various platforms (Lin et al., 2013, p. 164). Critical consumption, on the other hand, refers to sets of skills required to deconstruct and evaluate media messages being aware of the economic, political, cultural and social context these messages have been produced in. the critical consumption skills include those needed for an individual to be able to question the credibility of media messages through critiquing the content and the context. An individual's ability to analyze and evaluate the media messages through his/her own lens is another skill included in the critical consumption skillset (Chen et al., 2011, p. 86).

Functional prosuming skills refer to the technical know-how required to produce and distribute media content, replicate and reproduce different media forms such as text, image, audio and video (Lin et al., 2013). Examples of functional prosuming skills include signing up on a social media platform, sharing and distributing messages created by others on various platforms, and creating media messages in various forms including text, image, audio and video (Lee et al., 2015, p.85). However, critical prosumption involves the sets of skills for an individual to actively participate in social media platforms for creation of a collective culture, collaborating with others and creating unique media content reflecting his/her own sociocultural

values and ideologies. An example would be composing a textual message on new media platforms or on social media with a critical standpoint conveying his/her own opinions and ideologies (Chen et al., 2011, p. 86; Lin et al., 2013, p.164).

METHOD

Research Design

This study employs cross-sectional quantitative research method to examine the new media literacy (NML) skills of open and distance learners studying at a state university in Turkey. The study also seeks to investigate the aforementioned skills depending on demographic information of these learners. In order to determine the NML skills the researchers used the NML Scale developed by Lee et al. (2015) and adopted into Turkish by Genc Kumtepe, Kumtepe, Ugurhan & Saykili (2019).

The online version of the Turkish NML Scale, along with questions including demographic information, was shared on the learning management systems used by the university. A total of 1,862 learners completed the online self-report survey voluntarily. A data screening process and later normality assumption tests were conducted on the original dataset, which cleared the dataset off incomplete surveys and outliers. After these analyses, a total of 403 observations were removed from the dataset, which yielded 1,459 observations to carry out further analyses for the purposes of the study.

This study advances the preliminary search conducted by Genc Kumtepe et al., 2019 through incorporating further inferential statistics investigating the relationship between NML Skills and demographic information. Table 1 below briefly demonstrates the reliability and validity test results of the NML Scales developed by Scale developed by Lee et al. (2015) and adopted into Turkish by Genc Kumtepe et al. (2019), and Kara et al. (2018). The results validate the surveys as reliable and valid.

Table 1. The reliability and validity results of the NML Scales

Skills	# of Items	x^2	df	x^2/df	AGFI	SRMR	RMSEA	CFI	Cronbach's α
Lee et al. (2015)									
FC	6	21.43	9	2.38	0.97	0.02	0.05	0.95	0.88
CC	13	198.02	62	3.19	0.92	0.06	0.06	0.73	0.88
FP	13	177.99	62	2.87	0.93	0.05	0.06	0.73	0.91
CP	5	11.92	5	2.38	0.98	0.02	0.05	0.98	0.72
Kara et al. (2018)									
FC	6	25.91	8	3.24	-	0.02	0.04	0.98	0.80
CC	13	416.54	57	7.30	-	0.06	0.08	0.93	0.87
FP	13	444.30	62	7.16	-	0.05	0.08	0.93	0.89
CP	4	12.71	5	2.54	-	0.01	0.04	0.99	0.77
Genc Kumtepe et al. (2019)									
FC	6	15.59	9	1.73	-	0.02	0.03	0.99	0.76
CC	13	197.29	41	4.81	-	0.04	0.07	0.95	0.86
FP	13	177.28	40	4.43	-	0.04	0.06	0.96	0.90
CP	5	11.78	4	2.94	-	0.02	0.05	0.99	0.79
Cutoff Values (Hu & Bentler, 1999)				**<5**	**>0.85**	**<0.05**	**<0.08**	**>0.95**	**>0.70**

Participants

The participants for this study was 1,459 open and distance learners studying for the various associate and undergraduate programs at a state university in Turkey. These learners volunteered to take part in the study. 35.2% (n = 514) of these learners were male and 64.8% (n = 945) were female. The ages of learners ranged from 18 to 71, the age mean was 32.91 (*SD* = 10.69). Table 2 displays the age distribution of the learners, which indicates that the highest number of learners were in the 23-28 age group (n = 382; 26.20%), whereas, the lowest number of learners were in the 53 and above age group (n = 85; 5.8%).

Table 2. The age distribution of the participants

Age Group	n	%
18-22	268	18.4
23-28	382	26.2
29-34	238	16.3
35-40	207	14.2
41-46	182	12.5
47-52	97	6.6
53+	85	5.8
Total	**1459**	**100**

RESULTS

The results section of the study firstly presents both the descriptive statistics for both NML skills and the demographic information including gender, age, generation (X and Y), admission type, degree level, monthly income, occupation, internet usage and access to news. Furthermore, this section displays inferential statistics into the relationship between demographic information and NML skills.

Demographic Information

For the purposes of the study, several demographic information was collected. Table 3 below shows that the majority of the learners participating in the study was female (64.8%). In terms of generations, most of the participants were of Y generation, that is 39 and below (n = 1,062; 72.80%) while only 27.2% is of X generation (n = 397). The results also revealed that a little more than half of the participants were (53.1%) were enrolled in an associate degree, whereas the rest (46.9%) was enrolled in an undergraduate degree.

After analyzing the admission data, the admission type was grouped into two; second university and others. Learners admitted through the second university are accepted without taking the nationwide compulsory university admission test because they have already completed or are still pursuing an undergraduate degree in a different program. The other option includes admissions types such as the nationwide university admission exam and transfer students.

The results show that even though both numbers are close, more participants (52.2%) were admitted through second university than other admission types (47.8%). Regarding the admission year, most participants were found to enroll at the university in the year 2018 (52.2%), which is followed by learners between 2014 and 2017 (39%) and lastly 2013 and before (8.8%). In addition, a considerable number of participants reported they were employed in a part-time job (n = 658; 45.1%), while 38.9% was unemployed. On the other hand, 5.6% of the participants were housewives and 4.9% was retired. In terms of monthly income, most participants had a monthly income of between 2001 and 4000 Turkish Lira (39.3%) when only 3.7% reported earning 500 TL or below. Finally, most participants reported using the internet between 2 to 7 hours daily (75.6%), while a few participants reported using the internet 1 hour or less (8.2%) (Table 3).

Table 3. The demographic information of the participants

Variable		n	%
Gender	Female	945	64.8
	Male	514	35.2
Generation	X	397	27.2
	Y	1062	72.8
Degree level	Undergraduate	685	46.9
	Associate degree	774	53.1
Admission Type	Second University	762	52.2
	Other *(DGS, OSYM, additional placement etc.)*	697	47.8
Enrollment Year	2013 and before	128	8.8
	Between 2014 and 2017	569	39.0
	2018	762	52.2
Occupation	Unemployed	568	38.9
	Housewife	81	5.6
	Retired	72	4.9
	Part time employment	658	45.1
	Full time employment	80	5.5
Monthly Income (Turkish Lira)	500 TL and below	54	3.7
	Between 501 TL and 2000 TL	342	23.4
	Between 2001 TL and 4000 TL	573	39.3
	Between 4001 TL and 6000 TL	283	19.4
	6001 TL and above	207	14.2
Daily Internet Usage	1 hour and below	120	8.2
	2 – 7 hours	1103	75.6
	8+ hours	236	16.2
	Total	**1459**	**100**

Access to News

The study also investigated how participants accessed news. The results revealed that the primary media participants access news were online platforms, i.e. news websites and social media. 82% of the participants reported accessing news on news websites often or very often, while %76.4 (n = 1,115) used social media to access news. On the other hand, it was found that %53.4 (n = 779) of the participants accessed news on TV often or very often. Yet, similar numbers of participants reported reading newspapers seldom or listening to the radio seldom to access news (38.2% & 35.6%, respectively) (see Table 4 below).

Table 4. The Platform and Frequency of Access to News

Platform		Never	Seldom	Sometimes	Often	Very Often
Newspaper	n (%)	269 (18.4)	558 (38.2)	448 (30.7)	117 (8)	67 (4.6)
TV	n (%)	113 (7.7)	208 (14.3)	359 (24.6)	460 (31.5)	319 (21.9)
Radio	n (%)	444 (30.4)	519 (35.6)	324 (22.2)	120 (8.2)	52 (3.6)
Social Media	n (%)	46 (3.2)	102 (7)	196 (18.4)	466 (31.9)	649 (44.5)
News Websites	n (%)	24 (1.6)	58 (4)	181 (12.4)	426 (29.2)	770 (52.8)

Descriptive Statistics for the New Media Literacy Scale

Descriptive Statistics, including means and standard deviations, for the New Media Literacy Scale are displayed on Table 5 below.

Table 5. The descriptive statistics of the new media literacy scale (n = 1,459)

Construct	Mean	Standard Deviation
Functional Consuming (FC)	**4.67**	**0.44**
Critical Consuming (CC)	**4.35**	**0.55**
CC → Analysis	4.34	0.70
CC → Synthesis	4.62	0.53
CC → Evaluation	4.08	0.79
Functional Prosuming (FP)	**3.28**	**0.95**
FP → Distribution	2.98	1.23
FP → Production 1.0	3.36	1.19
FP → Production 2.0	3.51	0.89
Critical Prosuming (CP)	**2.91**	**1.06**

(1 = Strongly Disagree - 5 = Strongly Agree; 1 = Never - 5 = Very Often)

The results of the descriptive statistics in to the NML skills of the open and distance learners taking part in the study revealed that the mean for the functional consuming (FC) was 4.67 (*SD* = 0.44), for critical consuming (CC) 4.35 (*SD* = 0.55), for functional prosuming 3.28 (*SD* = 0.95), and finally the mean for critical prosuming was 2.91 (*SD* = 1.06) (Table 5). Therefore, the results indicate that the participants have higher consuming skills in general than prosuming skills. As to the comparison between FC and CC skills, the results suggest higher FC skills than CC, albeit slightly. On the other hand, the level of difference FP and CP was wider in favor of FP. Consequently, the fact that the highest mean was achieved on FC, and the lowest on CP skills suggests that the participants were the most skilled at consuming media messages and the least developed skills belonged to those of critically prosuming such messages. This result is in line with Kara et al. (2018). Kara et al. (2018) investigated the NML skills of pre-service on-campus undergraduate teachers, and similarly their results revealed consuming skills than prosuming. However, in comparison open and distance learners in the context of this study were found to have higher consuming skills (i.e. FC and CC) than pre-service teachers in the context of Kara et al. (2018) (FC = 4.67 vs 4.48, and CC 4.36 vs 3.67, respectively). On the other hand, although the open and distance learners in this study had higher critical prosuming skills than pre-service teachers in Kara et al. (2018) (CP = 2.91 vs 2.47), the open and distance learners had lower functional prosuming skills (FP = 3.28 vs 3.55), which necessitates further inquiry into the issue.

The difference between consuming skills, both FC and CC, might be attributed to the fact that open and distance learners are required, by the nature of the delivery of education online, to extensively utilize several online learning resources for their studies to achieve their respected degree. Besides, since a considerable number of learners in the context of this study are aged between 23-28, which correspond to ages after obtaining an undergraduate degree, thus second university admission. These learners might have already developed both functional and critical skills throughout their earlier educational experiences during their first undergraduate degree. In yet another context, Chen et al. (2018) investigated the NML skills of K12 students. In line with the findings of this study and Kara et al. (2018), they found that K12 students had lower prosuming skills than consuming. Consequently, the results of these three studies (i.e. this study, Kara et al. 2018, and Chen et al. 2018) suggest that individuals primarily utilize consuming skills, which naturally develop over time, and prosuming skills are less developed since individuals do not refer to then extensively.

When critical consuming skills are further investigated, it was observed the highest mean for the skill levels achieved belonged to synthesis skills (*M* = 4.62; *SD* = 0.53), which was followed successively by analysis (*M* = 4.34; *SD* = 0.70) and evaluation skills (*M* = 4.08; *SD* = 0.79). Higher synthesis levels, which indicates better skills at meaningfully remixing and sampling media messages, could be the result of active participation in

various social media platforms through exposure to various levels and forms of media messages. However, this issue needs further clarification through robust research designs including qualitative data. Furthermore, despite slightly lower means than synthesis skills, the analysis and evaluation skills are well developed in these participants considering the means for both these skills are over 4.0 in a 5-point scale. With respect to FP skills which were based on a five-point frequency scale, FP production 2.0 skills was observed to achieve a greater mean value (M = 3.51; SD = 0.89) than FP production 1.0 (M = 3.36; SD = 1.19) and FP distribution skills (M = 2.98; SD = 1.23). The fact that the participants reported higher FPP 2.0 reveals that they not only remix an existing content or create their own but also share it on web 2.0 media platforms. Considering the ease with which the new social media platforms provide users technical tools and user-friendly interfaces to create and remix media content, the increased frequency of FPP 2.0 skills is only rational. On the other hand, lower FPP 1.0 scores signify the lack of need on the part of the participants to utilize offline authoring tools such as Photoshop, which require some level of at least semi-professional technical know-how, to create media messages in the existence of Web 2.0 tools which already make the authoring processes much easier to handle. The lowest mean score achieved on FP distributions skills implies that the participants in the context of this study do not choose to share/distribute media messages as much as produce such messages.

New Media Literacy and Demographic Information

In addition to establishing the NML skills of the open and distance learners participating in the study, this study furthermore seeks to investigate the relationship between NML skills, i.e. FC, CC, FP and CP skills, and demographic information including gender, age, generation (X and Y), admission type, program level, monthly income, occupation, internet usage and access to news. For this purpose, Independent-Samples T-Test was conducted to examine whether NML skills differed significantly depending on gender, generation, admission type and program level. On the other hand, One-way ANOVA tests were used to examine the differences in terms of age, monthly income, occupation and time spent online. The following sections present the results of both t-tests and One-way ANOVA tests.

Test Results

When comparing genders, since homogeneity of variances was not achieved for FC (p<0.05) using Levene's Test equal variances not assumed option was chosen. On the other hand, for CC, FP and CP skills homogeneity of variances was achieved (p>0.05) equal variances assumed option was used. In terms of generation comparisons of X and Y, homogeneity of variances was not achieved for FC, FP and CP (p<0.05) while homogeneity of variances was achieved (p>0.05) for CC. As to the admission type, homogeneity of variances was not achieved for CC, FP and CP (p<0.05), however, variances was achieved (p>0.05) for FC. Yet, for degree level (associate vs undergraduate) homogeneity of variances was achieved (p>0.05) for all skill sets (Pallant, 2011). Table 6 below presents the results for the Independent-Samples t-Tests, which will be discussed in the proceeding sections separately.

Table 6. The study of the NML skills in terms of gender, generation, admission type and degree level

Variable		Group	n	*M*	*SD*	*t*	df
Gender	FP	Female	945	3.28	0.94	0.090	1457
		Male	514	3.28	0.96		
	FC	Female	945	4.70	0.41	**3.132****	917.42
		Male	514	4.62	0.48		
	CP	Female	945	2.86	1.04	**-2.369***	1457
		Male	514	3.00	1.08		
	CC	Female	945	4.33	0.54	-1.896	1457
		Male	514	4.38	0.55		
Generation	FP	X	397	3.02	0.88	**-6.837*****	768.74
		Y	1062	3.38	0.95		
	FC	X	397	4.54	0.49	**-6.230*****	605.88
		Y	1062	4.72	0.40		
	CP	X	397	2.59	0.94	**-7.669*****	807.43
		Y	1062	3.03	1.08		
	CC	X	397	4.26	0.57	**-3.837*****	1457
		Y	1062	4.38	0.54		
Admission Type	FP	Second University	762	3.26	0.91	-0.790	1412.98
		Other	697	3.30	0.99		
	FC	Second University	762	4.66	0.44	-1.065	1457
		Other	697	4.68	0.43		
	CP	Second University	762	2.87	1.02	-1.263	1418.51
		Other	697	2.94	1.10		
	CC	Second University	762	4.36	0.53	0.619	1423.28
		Other	697	4.34	0.57		
Degree Level	FP	Undergraduate	685	3.29	0.96	0.348	1457
		Associate degree	774	3.27	0.94		
	FC	Undergraduate	685	4.68	0.43	0.851	1457
		Associate degree	774	4.66	0.44		
	CP	Undergraduate	685	2.91	1.07	0.212	1457
		Associate degree	774	2.90	1.05		
	CC	Undergraduate	685	4.36	0.54	1.103	1457
		Associate degree	774	4.33	0.56		

***p<0.001; **p<0.01; *p<0.05.

New Media Literacy and Gender

In terms of gender, the results of Independent-Samples T-Test, as seen on Table 6, revealed significant differences in FC (t = 3.132; df = 917.42; p<0.01) and CP (t = -2.369; df = 1457; p<0.05). Notwithstanding, significant differences were not observed for FP and CC (p>0.05). These results illustrate that in comparison with male participants, female participants achieved higher FC while male participants achieved higher scores in CP. Nonetheless, the results disclose similar scores for male and female participants in CC and FP skill sets. These results present both similarities and differences compared to the results Kara et al. (2018) report, who observed significant gender differences in all skill sets in favor of male participants. While their study showed higher skill sets for male participants, this study revealed significant differences in FC in favor of female participants and in CP in favor of male participants, which requires further investigation to unravel these differences. On the other hand, Chen et al. (2018) discovered no significant differences in terms of gender in their study conducted with K-12 student in Singapore. The discrepancies between the results of these studies might be attributed to contextual differences of educational level (tertiary vs K-12), delivery of education (online vs on-campus), and culture (Turkish vs Singaporean), however more empirical studies are needed to establish this proposition.

Generations X and Y, and New Media Literacy

The results pinpoint significant differences between generations X and Y for all four skill sets composing NML skills (p<0.001) (Table 6). These results illustrate higher skills in favor of Generation Y (the younger generation) for NML skills (Figure 2), which is congruent with other research results (Chen et al., 2018; Arsenjevic & Andevski, 2016). Literature also confirms that younger generations achieve higher NML skills compared to the older generations.

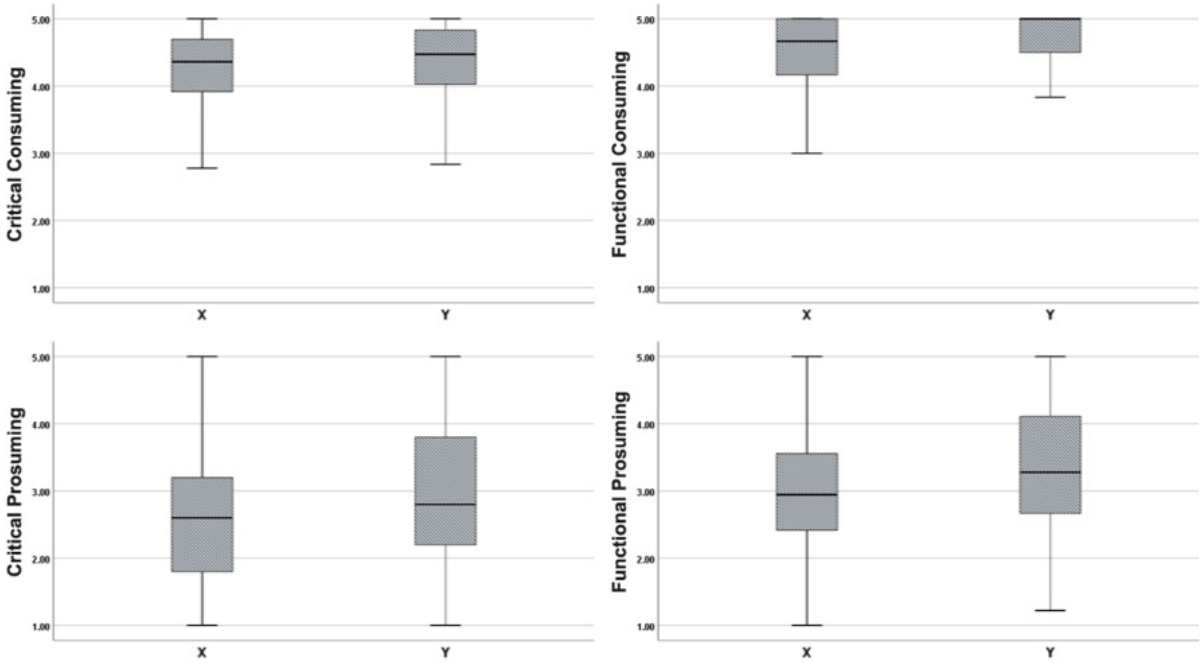

Figure 2. Generations X and Y, and New Media Literacy

Admission Type, Degree Level and New Media Literacy

Even though results revealed significant differences between generations, no significant differences were observed depending on admission type (second university and other) (p>0.05), which suggests similar NML levels for both admission types. Likewise, the results exhibit no significant differences in terms of degree level (associate and undergraduate) (p>0.05). NML skills for both associate and undergraduate learners are at similar levels.

One-way ANOVA tests were used to examine the NML skill differences in terms of age, monthly income, occupation and time spent online. Since Levene's Test of homogeneity of variances was not achieved for FC, CC and FP (p<0.05) regarding age, Brown-Forsythe statistic was used whereas ANOVA statistic was utilized for CP (p>0.05). In terms of monthly income, Brown-Forsythe statistic was used for CC and CP (p<0.05), while (p<0.05) ANOVA statistic was utilized for FC and FP (p>0.05). As to comparisons for occupation, Brown-Forsythe statistic was used for CP and FC (p<0.05), while (p<0.05) ANOVA statistic was utilized for CC and FP (p>0.05). For time spent online, Brown-Forsythe statistic was used for CC, CP and FC (p<0.05), however, ANOVA statistic was utilized for FP (p>0.05) (Pallant, 2011).

Table 7. Monthly income and NML Skills

Variable		Group	n	*M*	*SD*	*F*
Monthly Income	FP	500 TL and below	54	3.49	1.02	0.769
		Between 501 and 2000 TL	342	329	0.98	
		Between 2001 TL and 4000 TL	573	3.26	0.97	
		Between 4001 TL and 6000 TL	283	3.27	0.91	
		6001 TL and above	207	3.29	0.87	
	FC	500 TL and below	54	4.66	0.45	0.326
		Between 501 and 2000 TL	342	4.66	0.44	
		Between 2001 TL and 4000 TL	573	4.66	0.45	
		Between 4001 TL and 6000 TL	283	4.69	0.41	
		6001 TL and above	207	4.68	0.41	
	CP	500 TL and below	54	3.13	1.17	0.773 Brown-Forsythe
		Between 501 and 2000 TL	342	2.88	1.09	
		Between 2001 TL and 4000 TL	573	2.93	1.08	
		Between 4001 TL and 6000 TL	283	2.88	1.02	
		6001 TL and above	207	2.89	0.95	
	CC	500 TL and below	54	4.41	0.50	1.748 Brown-Forsythe
		Between 501 and 2000 TL	342	4.29	0.59	
		Between 2001 TL and 4000 TL	573	4.35	0.55	
		Between 4001 TL and 6000 TL	283	4.36	0.54	
		6001 TL and above	207	4.41	0.47	

Table 7 above demonstrates no significant differences between NML skills depending on monthly income (p>0.05), which suggests that monthly income is not a factor contributing to higher or lower NML skills. This result is contradictory to Arsenijevic & Andevski (2016) who reported significant differences in NML skills depending on monthly income in favor of higher income levels. However, the participants for their study also included university professors, which might explain the significant difference result since the open and distance learners participating in this study differ in terms of monthly income. The participants in this study are required to access and utilize online learning resources regardless of their monthly income, which might have contributed to leveling of NML skills for all participants. Besides, the age group, and the generation, most of the participants in this study belong to might have yielded to such results.

Table 8. Occupation and NML Skills

Variable		Group	n	*M*	*SD*	*F*
Occupation	FP	Unemployed	568	3.35	0.97	**3.491****
		Housewife	81	3.00	0.93	
		Retired	72	3.09	0.92	
		Part time employment	658	3.27	0.94	
		Full time employment	80	3.38	0.86	
	FC	Unemployed	568	4.71	0.40	**3.764**** Brown-Forsythe
		Housewife	81	4.66	0.45	
		Retired	72	4.50	0.54	
		Part time employment	658	4.66	0.45	
		Full time employment	80	4.65	0.44	
	CP	Unemployed	568	2.99	1.11	**2.649*** Brown-Forsythe
		Housewife	81	2.68	0.95	
		Retired	72	2.72	0.98	
		Part time employment	658	2.89	1.04	
		Full time employment	80	2.86	0.96	
	CC	Unemployed	568	4.38	0.54	**2.466***
		Housewife	81	4.20	0.60	
		Retired	72	4.32	0.52	
		Part time employment	658	4.35	0.55	
		Full time employment	80	4.28	0.57	

$^{**}p<0.01$; $^{*}p<0.05$.

Table 8 above shows that the NML skills significantly differ (p<0.05) depending on occupation; FP (F = 3.491; p = 0.008), FC (F = 3.764; p = 0.005), CP (F = 2.649; p = 0.033), and CC (F = 2.466; p = 0.043). In order to investigate FP skills significantly differ depending on which occupations Tukey post-hoc test was carried out. The results suggest a significant difference between housewives and the unemployed (md = 0.34; p<0.05). The unemployed participants demonstrated higher CP. For FC, post-hoc Tamhane test results revealed a significant difference between the unemployed and the retired (md = 0.21; p<0.05) in favor of the unemployed. Additionally, regarding CP skills, Tamhane tests demonstrated significant differences between the unemployed and the housewives (md = 0.30; p<0.05), between the unemployed and the retired (md = 0.26; p<0.05), which implies that the unemployed participants report higher CP levels compared to the housewives and the retired. Furthermore, for CC skills Tukey post-hoc test signaled a significant difference between the unemployed and the housewives (md = 0.18; p<0.05) in favor of the unemployed participants. The higher NML skills for the unemployed participants this study suggest that they might be spending more time online, which in return might have impacted positively on the development of NML skills since they do not necessarily have professional commitments to spare time for. Also, research report that the more time spent online, the higher NML skills (Literat, 2014). Apropos of time spent online and NML skills, Table 9 below presents One-way ANOVA test results examining the new media literacy skills in terms of time spent online.

Table 9. Time spent online and NML skills

Variable		Group	n	*M*	*SD*	*F*
Time Spent Online	**FP**	1 hour or less	120	2.81	1.03	**34.332*** **
		2 – 7 hours	1103	3.25	0.91	
		8+ hours	236	3.64	0.94	
	FC	1 hour or less	120	4.54	0.52	**8.652*** ** Brown-Forsythe
		2 – 7 hours	1103	4.67	0.43	
		8+ hours	236	4.75	0.40	
	CP	1 hour or less	120	2.44	1.12	**25.747*** ** Brown-Forsythe
		2 – 7 hours	1103	2.88	1.02	
		8+ hours	236	3.29	1.10	
	CC	1 hour or less	120	4.13	0.65	**16.532*** ** Brown-Forsythe
		2 – 7 hours	1103	4.34	0.54	
		8+ hours	236	4.50	0.51	

*** p<0.001.*

The results presented on Table 9 reveals significant differences in NML skills depending on time spent online (p<0.001). In order to determine among which groups was a significant difference, Tukey post hoc tests were utilized. The results demonstrated significant differences in terms of FP skills between participants spending 1 hour or less and participant spending 2 – 7 hours online (md = -0.44; p<0.001), and 8 hours or more online (md = -0.83; p<0.001). A significant difference was also observed between participants spending 2 – 7 hours and 8 hours or more online (md = -0.39; p<0.001). Furthermore, for FC skills Tamhane post-hoc test results showed significant differences between participants spending 1 hour or less and participant spending 2 – 7 hours online (md = -0.12; p<0.05), and 8 hours or more online (md = -0.21; p<0.001). Likewise, a significant difference was also detected between participants spending 2 – 7 hours and 8 hours or more online (md = -0.08; p<0.05). As for CP skills, Tamhane post-hoc test results demonstrated significant differences between participants spending 1 hour or less and participant spending 2 – 7 hours online (md = -0.43; p<0.001), and 8 hours or more online (md = -0.85; p<0.001). Moreover, a significant difference was

also detected between participants spending 2 – 7 hours and 8 hours or more online (md = -0.41; p<0.001). Similarly, regarding CC skills Tamhane post-hoc test results demonstrated significant differences between participants spending 1 hour or less and participant spending 2 – 7 hours online (md = -0.21; p<0.01), and 8 hours or more online (md = -0.36; p<0.001). Besides, a significant difference was also detected between participants spending 2 – 7 hours and 8 hours or more online (md = -0.15; p<0.001). The significant difference results in all four NML skill sets in terms of all groups of time spent online indicate that increased time spent online contributes to the development of NML skills. Widespread use of innovative Web 2.0 tools allowing individuals to easily create and share content as well as connect with each other on several levels enables such NML skills to flourish among individuals spending time on them. Furthermore, the ubiquity of such tools boosting the creation and distribution of new media content on several devices increasing mobility of individuals encourages them to spend more time online, which in turn equips individuals with opportunities to test and enhance NML skills (Figure 3).

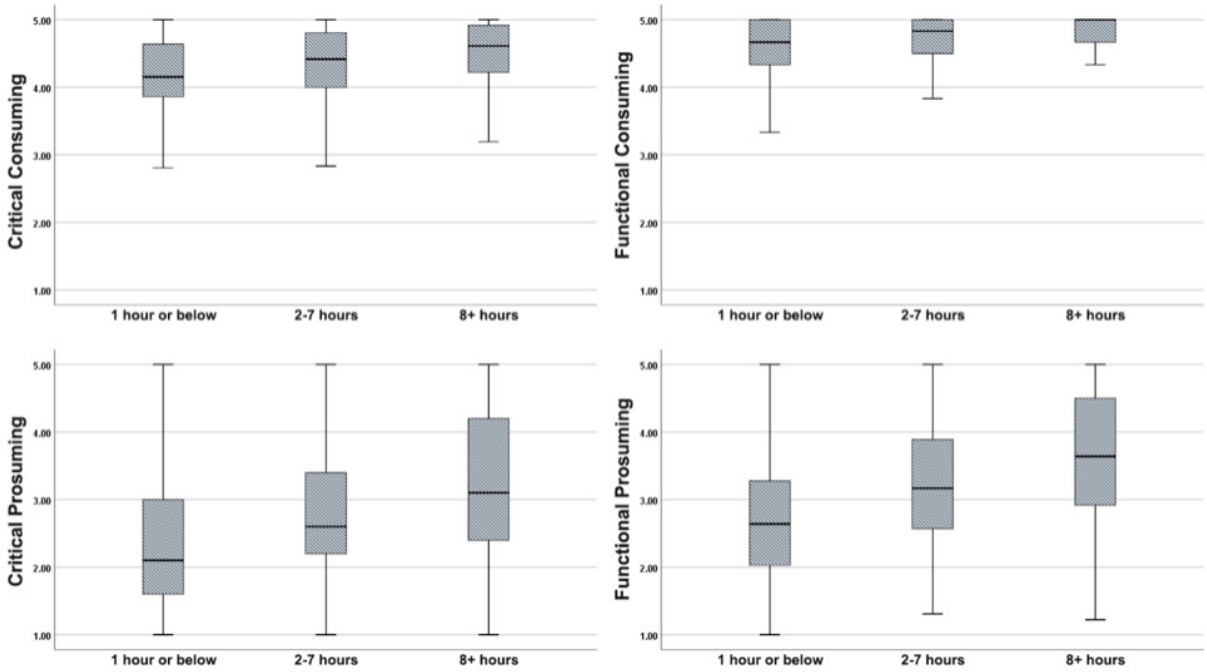

Figure 3. Time spent online and NML skills

Access to News and NML Skills

In this study, data regarding the media platforms the participants access news along with the frequency of access was gathered in order to investigate whether NML skills differed depending on the platform and frequency of access to news. Line graphs below show that in general the higher the frequency of access to news on each platform, the higher NML skills of the participants (Figure 4). On the other hand, although consuming skills (i.e. FC and CC) increased relatively gradually depending on the frequency of access to news on each platform, significant increase was observed for prosuming skills (i.e. FP and CP) for each platform depending on frequency of access.

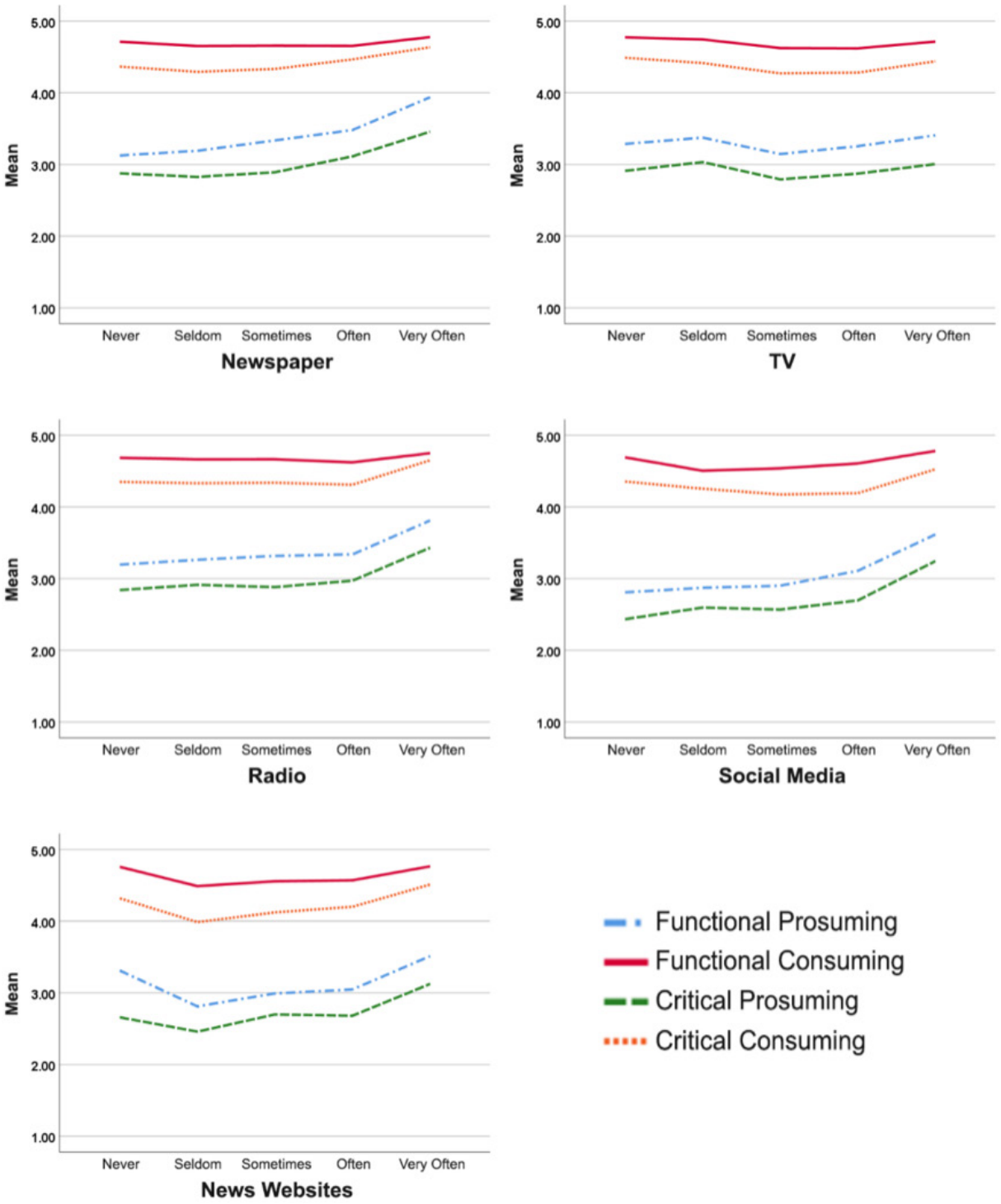

Figure 4. Access to News and New Media Literacy Skills

DISCUSSION AND CONCLUSION

The concept of media literacy has continuously been shaped and reshaped by the tools people use to consume and produce media messages to make up for the communication needs. Media literacy, which traditionally focusses on enabling individuals to become better-informed consumers of media messages, has undergone dramatic changes historically to reflect the characteristics of the tools used to consume or produce such messages. What has begun as making sense of symbols carved on basically stationary media such as stone tablets, has been transformed into a complex venture involving digital text, images and moving pictures in addition to digital tools promoting distribution of messages and enhancing digital connectivity

and sociality in the 21st century? Therefore, the traditional conceptualizations of media literacy have today fallen short in explicating what it entails to be a media literate individual in the digital age. Within this respect, the proposed framework to map the boundaries of new media literacy needs to be empirically tested for validity in multiple contexts. For these reasons, this study sought to investigate the validity of the NML framework within the context of open and distance learning institution since the delivery of education solely depends on such digital tool which requires the participants of this study to utilize the drivers of new media consumption and production. In addition to examining the NML skill levels of the participants, this study aimed to inspect such skills in terms of demographic information.

The results revealed that the participants had higher scores for consumption skills (FC and CC) than prosuming skills (FP and CP), which signifies that the participants in this context utilize consuming skills more than prosuming. This could be attributed to the fact that the participants in this context are primarily required to "consume" the learning resources they have been provided online. However, more in-depth studies adopting comprehensive data resources including qualitative and quantitative data might help find empirical propositions into the reasons for this occurrence.

Regarding demographic information and NML skills, the results showed significant differences between genders in terms of FC and CP while no such significant differences were observed for FP and CC skill sets. Specifically, the data suggested that female participants achieved higher FC skills than males, whereas, male participants scored higher on CP. Also, the results demonstrated significant differences between generations X and Y for all four skill sets composing NML skills in favor of Generation Y. Furthermore, the results revealed significant differences depending on occupation. The higher NML skills for the unemployed participants in comparison with other occupation groups this study suggest that they might be spending more time online, which in return might have impacted positively on the development of NML skills since they do not necessarily have professional commitments to spare time for. Similarly, the significant difference results in all four NML skill sets in terms of all groups of time spent online indicate that increased time spent online contributed to the development of NML skills. Lastly, the investigation of frequency of access to news in addition to the news access platforms showed regardless of platform the higher frequency of access to news, the higher NML skills. However, despite significant difference results in the aforementioned demographic information, the results demonstrated no significant differences in terms of admission type, degree level and monthly income. Further studies utilizing both quantitative and qualitative data need to be conducted to unravel the reasons for significant differences found in this study. In addition, the relationship between NML skills and other demographic variables excluded in this study such as program and the courses taken. Finally, the comparison of the NML skills of on-campus students and open and distance learners will contribute to understanding the impact of delivery mode on NML skills.

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