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Message from the Editor-in-Chief

Dear Colleagues,

TOJET welcomes you. It is a great honor for us that you are reader of this journal. Educational technology research, innovation and diffusion in teaching and learning are most important topics for the Turkish Online Journal of Educational Technology.

This journal was initiated in October 2002 to share knowledge with researchers, innovators, practitioners and administrators of education. We are delighted that many researchers, practitioners, administrators, educators, teachers, parents, and students from around the world had visited all issues. It means that TOJET has diffused successfully new developments on educational technology around the world. We hope that this issue will also successfully accomplish our global educational goal.

April 01, 2021

Editor,

Prof. Dr. Aytekin İŞMAN
Sakarya University

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Adopting TPACK to Video Technology in the Context of the Jordanian Education System

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ABSTRACT
This paper focuses on the use of video technology (VT) in Jordanian schools. The Jordanian Ministry of Education (MoE) has endorsed the use of VT in schools in recent times thus the number of schools employing VT in Jordan is expected to increase dramatically in the near future. One of the existing pedagogical frameworks that can help in understanding the integration of VT into teaching is TPACK. However, TPACK does not provide sufficient insight or understanding into the integration of this specific form of technology. Therefore, this paper presents the conceptualization of a novel modified theoretical framework specific to VT, namely Video-TPACK, which is adopted from TPACK. This paper then introduces a novel collection of pedagogical processes that can be integrated into Video-TPACK, namely Video-Based Pedagogical Processes (VBPPs). Engaging the VBPPs may encourage a "sweet spot" balance of teacher knowledge domains thus an optimal pedagogical outcome becomes more likely.

1 INTRODUCTION

Jordan is a small country located in the center of the Middle East, with Saudi Arabia to the east, Syria to the north, Iraq to the northeast, the Egyptian Arab Republic to the south, and the Dead Sea, Israel, and Palestine to the west. The number of schools employing Video Technology (VT) in Jordan is expected to increase dramatically in the near future (Oliemat, Ihmeideh, & Alkhawaldeh, 2018), since the Jordanian Ministry of Education (MoE), in conjunction with UNICEF and private schools, has launched its 'Digital Schools Program' to provide students with various technological devices for their learning. Therefore, understanding how teachers' adaptation of educational VTs in the classroom can translate to effective pedagogical practices is paramount (Abu-Samak, 2013; Mubaslat, 2012). Video technology can be defined as "digitally recorded content[s] containing sound and motion that can be streamed, stored or delivered live" (Woolfitt, 2015, p. 4).

Due to the increasing adoption of VT, examining the extent to which Jordanian school teachers use VT is important. Also, insight into the role of video-based technology may illuminate the Jordanian teachers' experience of using technology in teaching (Ajloni, 2019).

A knowledge gap exists in this subject matter as there has been limited research or literature on this topic, especially in the Jordanian context (Ajloni, 2019). Therefore, the present study seeks to begin closing this knowledge gap. To this end, this paper first presents the conceptualization of a novel modified theoretical framework specific to VT, namely V-TPACK, which is adopted from the Technological Pedagogical and Content Knowledge (TPACK) theoretical framework. The reason for the development of this novel theoretical framework (V-TPACK) is because VT is a specific form of technology. Rather than relying on the TPACK theoretical framework to understand the integration of VT into pedagogy, which is for general technology, a novel theoretical framework specific to VT will enhance this understanding and effectiveness. This paper then introduces a novel collection of pedagogical processes, namely Video-Based Pedagogical Processes (VBPPs), into this modified theoretical framework (V-TPACK). The VBPPs categorize a teacher's internal thinking processes, which provide a pathway to a teacher's cognition in a holistic manner.

These VBPPs, first conceptualized by Ajloni (2019), include selecting appropriate video content (selection) and delivered to students in an appropriate environment (environment-fit) whilst satisfying themselves of the value

that these videos may add to the students' learning (value attribution). Teachers should also be creative in their approach (creativity) and be aware of their role as teachers (role awareness).

2 VIDEO TECHNOLOGY AND TEACHING PRACTICE

The introduction of modern computer technologies has vastly changed the way teachers and students interact. Before now, education technology was treated as separate but necessary to pedagogy (Mishra & Koehler, 2006). Training pre-service teachers in educational technology was not a priority until the mid-1990s and it was largely maintained as a separate course in teacher education programs (Graham, Culatta, Pratt, & West, 2004).

The shift in pedagogy to include technological literacy has led to the conceptualization of technology as a form of pedagogical competence in teaching practice (Mishra & Koehler, 2008). This involves the skills and processes required to operate particular technologies and use videos in teaching practice. These skillsets complement teacher knowledge, thus enabling the effective use of videos in educational technology.

Continuing technological developments enabled videos to be accessed faster, more easily and across multiple platforms and devices. Videos can now be viewed on multiple (student owned) devices and in multiple formats before, during or after class. The increasing prevalence of technology in education is driving the viability and availability of online teaching and open academic resources. Video technology is playing a role in facilitating these developments (Bates, 2019). For example, Woolfitt (2015) believes that, "Education is undergoing a major shift" and that "brick-and-mortar classrooms are opening up to rich media content, subject matter experts, and to one another" (p. 5). This swift change has largely been influenced by technological trends and enthusiasm of people of all cultures as well as the rise of the use of digital technology and widespread access to the internet.

Mishra and Koehler (2006) have conceptualized three main criteria for the successful integration of technology for educational purposes: interactivity with video content, engagement, and knowledge transfer. These three criteria also apply to VT. Implementation of the VBPPs by teachers will likely fulfil these criteria (Ajloni, 2019). For example, selecting the right videos or engaging students with innovative technologies such as video games may enhance the level of interaction with students thus resulting in better engagement and knowledge transfer. Providing a comfortable learning environment or classroom with the right multimedia devices is likely to engage students and promote an overall positive learning experience.

Another recipe for successful integration of technology in teaching is to make teachers cognizant of their importance and implement their knowledge of the subject matter (content knowledge, CK), pedagogy (pedagogical knowledge, PK) and technology (technological knowledge, TK). These are considered as the three core knowledge domains in the TPACK theoretical framework.

Whilst VT in education is increasingly being adopted, there are barriers and limitations with this evolving trend. For example, poorly resourced and inadequately trained teachers may cause a loss of confidence in integrating VT into classroom practice. Lack of training in Information and Communication Technology (ICT) and Video-Based Learning (VBL) may hinder the effective use of VT in teaching practice (Mustafa & Cullingford, 2008; Unal & Ozturk, 2012). Other barriers include the digital divide that might be affecting the use of VT in developing countries (Khasawneh, 2015), paucity of educational information (Bakri, 2013), and the concern that the social elements of teaching (e.g., classroom interaction, student engagement, knowledge transfer) could be swamped by technology (Joseph, 2012). Financial constraints associated with VT may also be an influencing factor contributing to inadequate infrastructure for a vibrant and dynamic classroom environment that aligns with the environment-fit requirement (Joseph, 2012). Besides, VBL faces a number of challenges, for example copyright issues and the proliferation of videos from 'wannabe' teachers and educational video creators who practice as experts without a teaching qualification (Ajloni, 2019).

3 TPACK THEORETICAL FRAMEWORK

This study has adopted the Technological Pedagogical and Content Knowledge (TPACK) framework as the primary theoretical perspective, which is diagrammatically illustrated in Figure 1. TPACK envisions effective teaching with technology as existing in a space where pedagogy, content, and technology overlap (Mishra & Koehler, 2006, 2009). The framework provides the basis for understanding how teachers can integrate the technological domain of knowledge with other teacher domains so that learners are able to understand the subject matter. It can also be viewed as a guided pathway to successfully plan, integrate, and deliver effective teaching programs that consist of technological integration.

TPACK has three core teacher knowledge domains and are listed as follows (Mishra & Koehler, 2006):
(1) Content Knowledge (CK) → Knowledge of subject matter or curriculum ("what" is being taught);
(2) Pedagogical Knowledge (PK) → Knowledge of effective teaching practices ("how" it is being taught);
(3) Technological Knowledge (TK) → Knowledge of relevant technological competencies (the tools used in teaching);

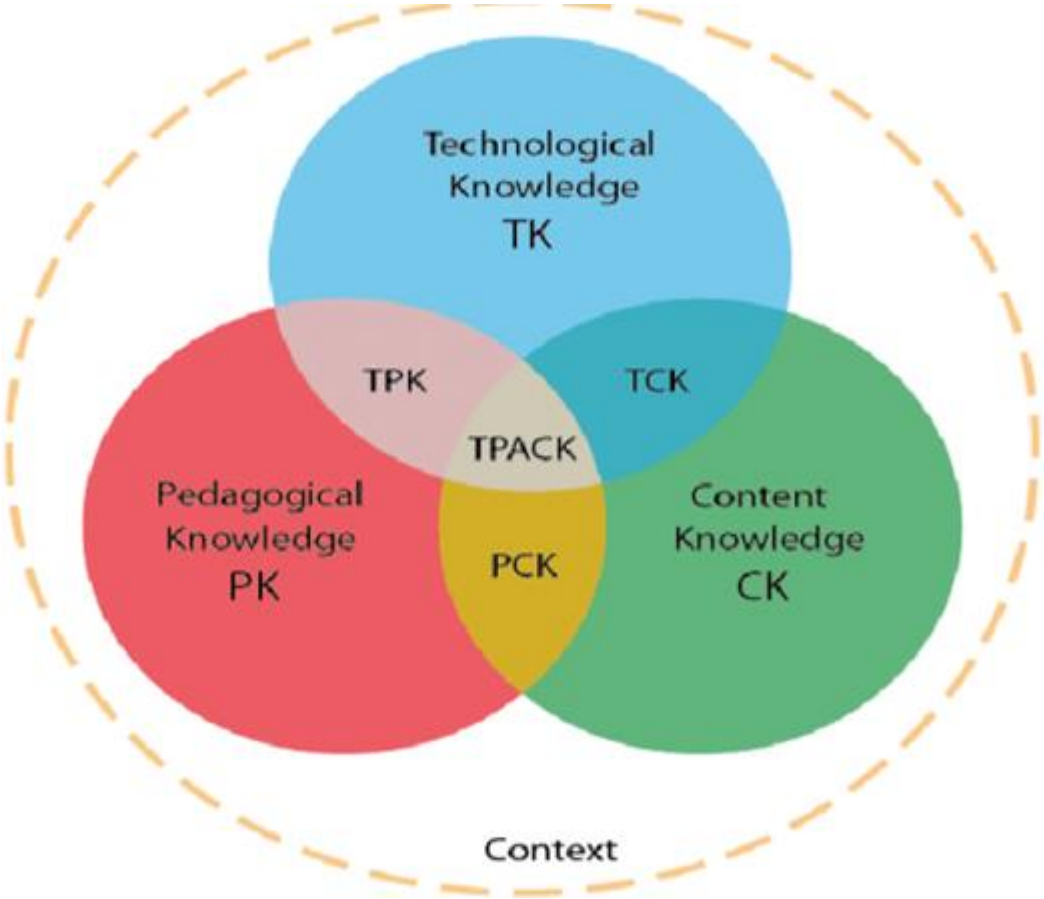

Figure 1: TPACK Framework model (Saad, Barbar, & Abourjeili, 2013, p. 5)

These core domains can be viewed as standalone aspects or in conjunction (or interaction) with each other as schematically illustrated in Figure 1. The interaction of these core domains results in a further four more domains as follows:
(4) Pedagogical Content Knowledge (PCK) → Integrating effective teaching practices into relevant subject matter;
(5) Technological Content Knowledge (TCK) → Integrating technological competence into relevant subject matter;
(6) Technological Pedagogical Knowledge (TPK) → Integrating effective teaching practices with the appropriate technological aids;
(7) Technological Pedagogical and Content Knowledge (TPACK) → The combination of these domains.
From a historical perspective, TPACK is an extension of Shulman's (1986) conceptualization of Pedagogical Content Knowledge (PCK), which "stands for specialized kind of teacher knowledge [that] searches for the influence of technology on adopted pedagogical approaches" (Ocak, 2016, p. 7).

Most researchers recommend the TPACK framework as a lens through which the complex challenges posed by the pedagogical integration of technology can be examined (e.g., Graham, 2011; Mishra & Koehler, 2006). However, despite the robustness of the framework, a number of issues and concerns exist in relation to its use and application (Graham, 2011; Graham et al., 2009; Harris & Hofer, 2009).

An issue that might hinder the effective application of the TPACK framework is the problem of digital divide, in which some teachers may not have computers or a secure internet connection (e.g., Ertmer, 2005; Scherer, Tondeur, & Siddiq, 2017).

Another issue is that the TPACK framework assumes guaranteed acceptance of Content Knowledge (CK) by students when integrating ICT into teaching, which may not necessarily be the case (Mishra & Koehler, 2006). In some circumstances, students may still struggle to comprehend the content regardless of the technology that is used for teaching.

In addition, it is possible that the interaction between the TPACK domains may vary depending on the content area and other contextual factors such as teachers' level of education and the students' socio-demographic profile (Koehler, Mishra, & Cain, 2013). For example, teachers who are technologically illiterate may not be familiar with the important of TK compared to those who are technologically savvy. Therefore, technological integration and trying to achieve effective pedagogical outcomes purely with consideration to TPACK domains may neglect a host of other variables that may also play a significant role (Ertmer & Ottenbreit-Leftwich, 2010; Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2013).

4 VIDEO-TPACK (V-TPACK) - A MODIFIED THEORETICAL PERSPECTIVE

The conceptualization of a novel modified theoretical framework specific to VT, namely Video-Technological Pedagogical and Content Knowledge (V-TPACK), is presented in this section and is diagrammatically illustrated in Figure 2. It is adopted from the TPACK theoretical framework. The reason for the development of this novel theoretical framework is to offer an enhanced understanding (compared to TPACK) of how VT can be effectively integrated in pedagogy. The V-TPACK offers enhanced understanding because it specifically deals with VT whereas TPACK deals with technology in general.

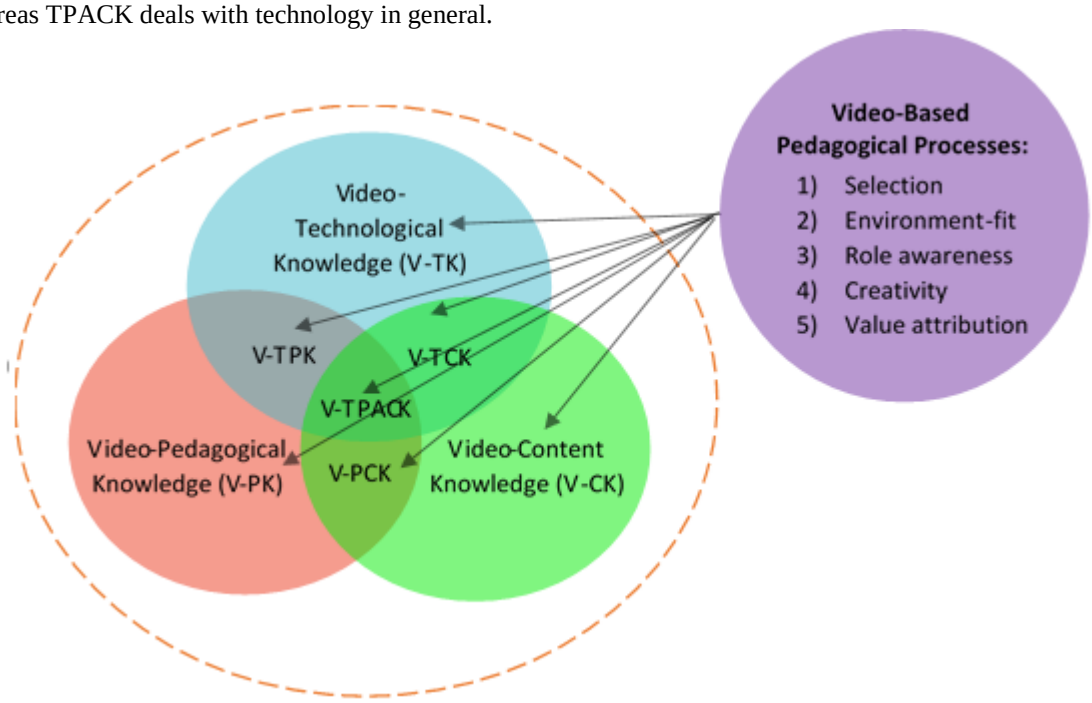

Figure 2: Video-TPACK theoretical framework (modified from TPACK)

Whilst TPACK is well established and widely studied to-date, there is limited research and literature that focuses on the specific relationship between VT and pedagogy. This is one important limitation of using TPACK to study this specific relationship. This gap in research could be addressed with additional studies focusing on the dynamics of V-TPACK (hence expanding on TPACK).

As Shulman (1986) reasoned, teachers' knowledge of effective practice requires transforming content into pedagogical forms that are accessible to learners. It can thus be argued that TPACK can encapsulate this through the recognition of the role of VT in teaching (thus the conceptualization of V-TPACK). The V-TPACK theoretical framework enables teachers to become curriculum planners who transform existing video-based media tools for pedagogical purposes and provides a reference to strike a perfect balance between each of the teacher domains.

All seven teacher knowledge domains from TPACK can be adopted into the V-TPACK theoretical framework. Each of these domains are similar to those in the TPACK framework but specific to VT's rather than in relations to technology in general. The seven domains in the V-TPACK framework are thus V-CK, V-PK, V-TK, V-PCK, V-TCK, V-TPK, and V-TPACK (refer to Figure 2) and are defined below. These domains are novel and have not been used or defined in any other studies.

Video-Content Knowledge (V-CK): The knowledge about the subject matter that is being taught in the context of VT. It is about knowing the theories and facts in a subject matter as well as the rules of evidence, proof to generate justification, and the nature of the inquiry in the field.

Video-Pedagogical Knowledge (V-PK): The knowledge of effective teaching practices with respect to teaching with the aid of VT. Accordingly, this involves knowledge about teaching techniques or methods, educational purposes, characteristics of learners, classroom management, lesson plan development, and ways to evaluate the understanding of learners.

Video-Technological Knowledge (V-TK): The knowledge of how to use emerging and basic VT's in teaching practice. This refers to the use of technology which can operate video devices, troubleshoot problems, notice the advantages and constraints of the VT.

Video-Pedagogical Content Knowledge (V-PCK): The intersection of V-CK and V-PK domains. This represents the simultaneous consideration of these two domains rather than in isolation. The subject matter is organized, adapted and represented for instruction based on effective teaching techniques (Shulman, 1986).

Video-Technological Pedagogical Knowledge (V-TPK): Describes the relationship and interaction between VT tools (V-TK) and specific video pedagogical practices (V-PK). It can also be considered as the link between TPK and VT. It explores the many ways teaching practice is advanced through the use of VT. The practice of teaching with the aid of VT is organized and adapted with consideration to sound pedagogical practices.

Video-Technological Content Knowledge (V-TCK): Intersection of the V-TK and V-CK domains. It describes the taught subject matter (V-CK) through the aid of viewing/displaying with VT which teachers might use as a part of their technological tools (V-TK). V-TCK can also be considered as knowing how VT can transform and create new understanding of a specific content area.

Video-Technological Pedagogical and Content Knowledge (V-TPACK): The intersection between V-TK, V-PK and V-CK domains. Pedagogical reasoning is thus blended with subject matter as well as VT with the understanding of how it can be used to support the teaching and learning objectives and content goals. It represents the "sweet spot" or "goldilocks" where the proportion of each of the ingredients (domains) is in optimal balance.

These domains are interrelated and may in some way or form related to different pedagogical processes involved in using VT for educational purposes. These processes are referred to as the video-based pedagogical processes (VBPP's). The VBPPs is a novel collection of pedagogical processes that categorizes a teacher's internal thinking processes, which provides a pathway to understanding a teacher's cognition in a holistic manner. In this conceptualization, the VBPPs are integrated into the V-TPACK theoretical framework. This is done not only to elevate the understanding of how each domain of V-TPACK can be developed and used in pedagogical practice, but also to act as a guide for teachers' cognitive processes in order to achieve the most favorable development of each of the domains. The integration of these processes is schematically illustrated in Figure 2. There are five elements to the VBPPs and each of these are defined below (Ajloni, 2019):

(1) Selection → Selecting the appropriate video content by the teacher as part of his/her behavior response;
(2) Environment-fit → Choosing a conducive learning environment or classroom for playing educational videos;
(3) Role-awareness → Cognitive response involving the recognition of the role of teachers in using VT within the classroom;
(4) Creativity → Teachers' cognitive response that involves the exploration of innovative methods of teaching using VT as a tool; and
(5) Value attribution → Teachers ascribing value to using VT for educational purposes.

A detailed description of the VBPPs and how they can be integrated into the V-TPACK domains is provided in a later section of this paper. As previously discussed, a favorable pedagogical outcome is likely to result from having all three core domains of V-TPACK in balance. Integrating the VBPPs to each of the domains will assist with developing the potential and balance of the domains. However, there are various factors that may inhibit this. These include external factors such as educational (e.g., private vs public schools), geographic (e.g., rural vs urban areas) and socio-demographic (e.g., age group).

For example, a potential lack of funding for ICT resources in a public school may hinder access of VTs for both students and teachers. In the context of the Jordanian education system, teachers in private schools may have greater access to appropriate technological tools due to their access to more funding from the private sector (Ajloni, 2019). This is an external educational factor that may negatively affect the ability of public school teachers to

fulfill the V-TK domain, thus the ability to achieve an optimal balance of the three core domains will be jeopardized.

Similarly, geographic factors may also play a role. Rural schools in Jordan are less equipped than those in urban areas in terms of ICT equipment and internet access. This may hinder access to VTs for both students and teachers (Ajloni, 2019). In contrast, easy access and up-to-date digital teaching technologies in urban areas, internationalization of urban private schools (most of which might have innovative teachers with international experience) and the general positive attitudes of urban school teachers towards enhancing teaching and learning all contribute to an advantage over rural schools (Harris, Straker, & Pollock, 2017). Therefore, because of this type of geographic factor, teachers in rural schools may find it difficult to exercise their knowledge in the V-TK and V-PK domains compared to their urban counterparts.

An external socio-demographic factor such as gender of the teacher may also have an impact on the teacher's ability to find a good balance in the V-TPACK conceptualization. For instance, female teachers in the Jordanian education system were found to be more knowledgeable and willing to integrate various forms of VTs in their teaching techniques than their male counterpart (Ajloni, 2019). Female teachers in Jordan are thus more inclined to exercise their knowledge in the V-TK and V-PK domains, hence imply they can find a good balance of the core domains in V-TPACK more readily than male teachers.

Integrating technology in classrooms is a complex issue that requires a broader understanding of complicated interactions among multiple components (Koehler, Mishra, & Yahya, 2007). Niess (2005) argued that while VT has become an integral component in schools, teachers must also develop "an overarching conception of their subject matter with respect to technology and what it means to teach with technology" (p. 510). In order to help teachers to better integrate technology into their teaching, educators need to grasp what successful technology integration entails and what the underlying factors are that could foster or hinder it. Some of these factors have been discussed above.

Despite the potential benefits of V-TPACK in understanding effective integration of VT in classrooms, one limitation to the robust usage of this framework is that it is in its early stages of development, and hence the framework is still evolving. Despite V-TPACK being adopted from TPACK, which is well established, elements of the new framework are yet to be fully understood and appreciated.

5 VIDEO-BASED PEDAGOGICAL PROCESSES AND V-TPACK

While the V-TPACK framework emphasizes how the interaction between content, pedagogy and technology is relevant, what is less clear is how these knowledge domains are shaped by the overall disposition toward the integration of VT. The VBPPs categorizes a teacher's internal thinking processes, which provides a pathway to a teacher's cognition towards the integration of VT in a holistic manner. There has been limited to no studies exploring the relationships between different domains of teacher knowledge and VBPPs in relation to the integration of VT in pedagogy. Understanding the nature of these relationships would help clarify how best to integrate VT in teaching practice and which VBPP are most effective for facilitating this integration and enhancing teacher knowledge. In other words, VBPP's involved in teachers' use of VT may shape the domains of knowledge in V-TPACK. There are five elements to the VBPPs (selection, environment-fit, role awareness, creativity, and value attribution) and each of them have been defined in the previous section of this paper. The influence of VBPP's to each of the V-TPACK domains are discussed below.

5.1 Video-based pedagogical processes and the V-PK domain

With respect to the V-PK domain, the selection of the right VT in pedagogical activities could make teacher practices clearer or easier to understand difficult concepts. Similarly, teachers may add value to pedagogical practices by integrating their own experiences or knowledge with respect to VT. The V-PK domain can be conceptualized as the creativity to rethink and re-imagine how teachers in the 21st century can better use modern technologies, including video, to change the boundaries of pedagogy. The creative process in the use of VT plays a role in enhancing learning and teaching practice using innovative techniques. Successful teaching also means teachers being aware of their role in pedagogical practices with the aid of VT and be cognizant of how the use of such aids may enhance the overall experience.

Teaching in a conducive learning environment is essential for knowledge distribution in a classroom where VT is use (Ajloni, 2019). Teachers could choose the kind of classroom equipment they need and the suitability of the environment for streaming video segments and instructional videos. The environment fit process, for example, demonstrates how the teacher is not only the distributor of knowledge with video choice but also choosing the

right learning environment based on their experiences and technological expertise (Subramaniam, Ahn, Fleischmann, & Druin, 2012).

5.2 Video-based pedagogical processes and the V-CK domain

The use of VT may also be beneficial in improving the teacher's content knowledge (V-CK). This knowledge domain is another important model that is often utilized in the classroom. It is understood as "knowledge about the actual subject matter that is to be learned or taught" (Graham, 2011, p. 1954). This can include the knowledge of central facts, concepts, theories, and procedures within a learning field (Mishra & Koehler, 2006). There are several ways VBPPs may shape teacher's V-CK domain.

For instance, teachers skilled in the selection process are more likely to have richer content than those who are less knowledgeable since the videos they choose would enrich their own teaching experience. In addition to this, teachers with demonstrated knowledge of their subject area would find it easier to select appropriate videos for their students, without necessarily overwhelming the students with irrelevant video content (Oz, 2015).

The creative process may be another way of enriching V-CK since teachers may draw on innovative and unconventional techniques in the creative process to enhance their subject matter (Hsu, Liang, Chai, & Tsai, 2013). Similarly, teachers with advanced expertise in their subjects are most likely to create their own versions of videos to help their students learn better than those with insufficient knowledge as part of the creative process (Hasse, 2017).

The environment-fit, role awareness and value attribution processes are also relevant for the V-CK domain. This could mean that teachers may attach or enhance the value to the subject matter been taught, and at the same time could try other innovative ways of preparing their learning content with the aid of VT (e.g., by using video games). Given that these teachers are subject matter experts, they would determine which learning environment with VT might be needed for teaching and learning the content in the environment-fit process. Overall, when using VT, teachers with advanced knowledge of their subject and aware of their role as teachers would be more likely to engage their students with curriculum than those less familiar with their subject area.

5.3 Video-based pedagogical processes and the V-TK domain

Knowledge of VT can also play a role in facilitating learning within educational settings and fostering teacher knowledge. Teachers may select the most appropriate VT based on their knowledge of what is available, which will enhance the overall learning experience for students. However, while using VT has some benefits, Praetorius, McIntyre, and Klassen (2017) have pointed out some challenges in integrating this technology into the classroom. For example, teachers who are not technologically savvy may struggle to effectively integrate the VBPPs and thus potentially result in a lower student educational attainment.

Teaching is unlikely to improve by virtue of having VT available in the classroom alone, such as simply placing a camera in the classroom or allowing students to watch random video clips from YouTube or other platforms. Through the role-awareness process, teachers facilitate enthusiasm and foster curiosity of students by being cognizant of positive pedagogical practices such as encouraging them to adopt new forms of VT when it is available. Teachers should also be knowledgeable on what type of environment would be conducive to learning for the selected VT. For example, the use of interactive VT may sometimes be best presented individual students to achieve the best outcome whereas non-interactive VTs such as watching a video may best be presented to a large group instead.

Through the creative process, teachers may use their knowledge of VT devises to stimulate students' interest and learning (Yee, 2016). For example, technologically savvy teachers may enhance students' learning experience by introducing creative forms of VT, such as interactive video games. Another example is the creation of video content by technologically knowledgeable teachers for their classes, which is also part of the selection process (Couse & Chen, 2010).

Teachers can use their knowledge of VT to attribute value to the learning process by combining the appropriate aspects of different forms of VT to promote a better pedagogical outcome. Isman, Abanmy, Hussein, and Al Saadany (2012) claim that using video in pedagogy has become easier and more engaging for both teachers and students, and that learning occurs more quickly and accurately through the use of VT because of the value attributed to this process. For instance, a physics teacher who is knowledgeable in various forms of VT may choose to utilize an interactive computer simulation software to generate video animations of a science phenomenon. The teacher's exercise of his/her knowledge in VT in this instance has ascribed value to the teaching process by making a difficult science concept easier to comprehend.

5.4 Video-based pedagogical processes and the V-PCK domain

With the conceptualization of the V-PCK framework, a teacher's understanding of how to amalgamate the V-PK and V-CK domains is the key to effective teaching practice in the context of VT. Rather than focusing on developing content and pedagogical knowledge in isolation, it is in this intersection of the two domains that teachers are best able to anticipate students' learning needs for a particular subject matter through the implementation of the VBPPs.

As part of the selection process, teachers may be knowledgeable in the selection of optimal instructional approaches for the subject matter at hand in conjunction with the choice of VT. Teachers may scaffold the learning experience and encourage curiosity in relation to the content being taught through teachers' role awareness. The creative process is also another way of enhancing delivery of a subject matter by employing new innovative pedagogical practices that may be video-based (Jang & Tsai, 2012). For example, when teachers do not integrate technology into their V-PCK, they miss out on the innovative ways VT could enrich student learning, since they revert to their conventional teaching practices (Hansen & Erdley, 2009; Niess et al., 2009).

Teachers can use their knowledge of the subject matter to attribute value to the learning process by combining the appropriate aspects of various forms of VT to their pedagogical practices. The overall learning experience can also be enhanced if teaching of the subject matter is delivered in an environment that is appropriate for the topic and the type of VT aid being used. For instance, an English literature teacher may choose to show his/her students a video of a Shakespearean play (rather than reading from the text), and intermittently pausing the video to explain pertinent dialogues. The teacher knows from previous experience that this method of teaching Shakespearean plays generally results in good knowledge transfer.

5.5 Video-based pedagogical processes and the V-TCK domain

The VBPPs can be applied to the knowledge of how to use VT to develop, design or deliver a subject matter in order to enhance the students' learning experience. For example, in the selection process, choosing the right learning material and the right VT aids can be beneficial in enhancing the learning content that is being developed. The environment-fit process is also an important procedure for the V-TCK domain. As an illustration, science teachers may prefer using a lab setting equipped with the relevant VT tools when teaching their subject matter compared to the conventional classroom (Jang & Tsai, 2012, 2013). Such teachers may choose to take a picture of equipment, record an experiment or integrating some other creative means of VT (such as interactive video games) that will be shared with students as part of the learning content. The role awareness of teachers is reflected in their commitment to ensuring that appropriate videos are used in developing and delivering their content.

Teachers who are aware of their role in integrating VT in their teaching practice are more likely to use available VT tools to prepare their curriculum due to the implied elevated commitment. Such dedication can also extend to exploring other ways of enhancing the study curriculum thus resulting in the attribution of value to the pedagogical practices. The application of all these VBPPs to the V-TCK domain is likely to enhance the overall teaching practice and learning experience.

5.6 Video-based pedagogical processes and the V-TPK domain

The link between VBPP and V-TPK can be understood by exploring the many ways teaching practice is advanced through the use of VT. This is seen in the selection process in which the teacher searches for videos that can help in clarifying, simplifying, or enhancing their pedagogical activities (Yee, 2016). For example, curating online learning videos for classroom use can be one of the ways a teacher incorporates the selection process as part of the V-TPK domain.

As part of the environment-fit process, the focus is on having a technologically-equipped classroom that is conducive to effective learning and advances or contributes to the pedagogical direction of the teacher (Torrington, 2018). For example, teachers who use classroom environments that are equipped with data projectors and good sound systems may likely have a higher level of pedagogical outcomes compare to those who teach in a traditional classroom setting without such technological devices.

Through the role awareness process, teachers may be aware and knowledgeable in effective pedagogical practices, behaviors and attitudes while conveying educational knowledge via the use of VT aids (Eady & Lockyer, 2013). For instance, a teacher may be cognizant of the need to improve his/her knowledge delivery skills by evaluating all VT options, then selecting a particular form of VT that is most suitable for his/her teaching method and objectives.

Through the creative process, teachers may choose to deploy innovative pedagogical activities to complement their use of VT to enhance the overall outcome of their teaching practice. Similarly, teachers may adopt or employ innovative video-based technological strategies to polish and enhance their pedagogical activities. For example, research suggests that most teachers use innovative video games and other contemporary VT's to advance teaching and learning strategies (Shliakhovchuk, 2018).

Lastly, it is important to understand that teachers who adopt some elements of the VBPPs would naturally imply the attribution of value and importance to using VT to advance teaching practice (Levin & Wadmany, 2006). For instance, a teacher who utilises innovation and alternative VTs in enhancing their teaching and managing instructional video content would naturally ascribe value to the educational process. Similarly, teachers who proactively use innovative means to create instructional videos to enhance understanding of a subject matter would demonstrate recognition of the teachers' role in using VT, which in turn amplifies value ascribed to the teaching practice.

5.7 Video-based pedagogical processes and the V-TPACK domain

Depending on the circumstance, some of the VBPPs may be integrated into a one or more domains of V-TPACK. They may also be processes in isolation or may be inter-related to each other. The situations where the VBPPs are integrated into a single domain have been described in the sections above. This section describes the situation where the VBPP's are simultaneously integrated into all three core domains of V-TPACK.

As described in a previous section, the V-TPACK is the intersection of the three core domains (V-CK, V-PK and V-TK) and that there are seven domains in total. The application of VBPPs to all three core domains of V-TPACK maximizes the potential of each one and is thus more likely to result in an optimal pedagogical outcome ("sweet spot").

For example, a teacher may choose to integrate an interactive whiteboard (IWB) (a form of VT, chosen via the selection process) with the subject matter being taught (V-CK), which is done in conjunction with the adoption of a suitable teaching style (V-PK). This may result in an additional appreciation of what kinds of VT's (V-TK) and environments are appropriate for learning (environment-fit process) with this particular form of VT (Jang & Tsai, 2012).

Another example is when a physics teacher attempts to make a difficult science concept (V-CK) more memorable, easier to understand or captures students' attention (value attribution). This may be achieved by selecting an appropriate video clip from the internet such as YouTube (selection process) and then followed up by interactive "hands on" video game pertaining to the content which he/she has created (creative process). In this example, the teacher needs to utilize his/her knowledge of different forms of VT's (V-TK) in order to successfully select and create the most appropriate combination of video clip and interactive game. The teacher would also need to utilize his/her knowledge of various teaching methods and styles in order to recognize that an interactive "hands on" video game would make a difficult scientific concept easy to understand and remember (V-PK).

6 Practical implementations of using video technology in classroom

6.1 Practical issues of the use of video technology

Several practical issues might be considered when video technology (VT) is integrated to the classroom. One important practical issue is the lack of teacher experience on how to integrate VT in the classroom (Abdallah, 2010; Pongsapan, 2014). In this case, teachers might refuse to use VT in classroom because they considered traditional methods to be more effective. Alternatively, these teachers might use VT in their teaching practices, but it is not in effective way. This can be solved by allocating some training session on how to use and integrate VT into teaching practices (Ajloni, 2019).

Another practical issue comes to my mind is a teacher lack of good video-technological equipment or IT support for their respective departments (Greenberg & Zanetis, 2012). A study conducted in Amman, Jordan by Ajloni (2019) explained the variance between teachers who are good in their selection of video and highly value using VT due to the support they receive from their IT departments, compared to who scored lower on these aspects because of the lack of support from their school or IT department (Ajloni, 2019). It was also revealed from the quantitative data that teachers face issues when accessing IT equipment. There are statistically significant differences in selection response and value attribution response, which varied based on the IT support provided by schools. As expected, teachers who are supported by their school departments consistently scored higher in two of video-based pedagogical processes (VBPPs) usage involving the selection of video and value attributed to using video compared to those suggesting dissatisfaction with support for selection process, and for value attribution process. This issue can be solved by increasing the level of IT support from their department which might help

teacher who had already faced some difficulties on how to select and value attributed to the use of video technology in their teaching practices. Perhaps schools should take note that a supportive environment, where the technological aspirations of their teachers can be supported, may enhance their students learning outcomes. Doing so may improve the positive perception of VT in the minds of students and teachers, thus increasing its acceptance as an effective tool for teacher and an improved learning experience may naturally follow (Ajloni, 2019).

In addition, teacher might note the lack of internet access as an issue to their teaching practice. Ajloni (2019) found that teacher who has access to the internet was an influential factor in determining whether VT is adopted into their teaching practice. As indicated in his findings, teachers have indicated that poor connection and constant internet interruptions were common obstacles. This result does not come as a surprise since some studies have highlighted the significant role of access to the internet in teaching practice (e.g., Jamieson-Proctor, Finger, & Albion, 2010; Mishra & Koehler, 2009). One teacher indicated that the use of VT would be welcomed if internet access is more available. One obvious way to improve the acceptance of VT is to make the internet available to all teachers. Teachers who already have internet access might further improve on the acceptance of VT in the classroom if teacher behaviour is consistent with all components of the VBPRs rather than the role awareness and value attribution responses alone.

6.2 Current attitudes

There have been previous studies conducted to discover the relationship between the pedagogical practices and VT (e.g., Tondeur, Van Braak, Ertmer, & Ottenbreit-Leftwich, 2017). However, there are currently limited studies providing insights into this relationship in the Jordanian context.

To close this knowledge gap, it is recommended that Jordanian teachers and the schools from kindergarten to tertiary level will be surveyed to find out the extent and how VT is used by teachers.

7 CONCLUSIONS

The existing pedagogical theoretical framework TPACK, whilst well established and accepted, provides limited insight into the role of VT for teaching in the context of the Jordanian education system. The present study aims to close this knowledge gap by investigating the use of VT for teachers in Jordan.

To investigate this relationship, a modified theoretical framework Video-TPACK (V-TPACK) is conceptualized and presented in this paper. The V-TPACK is derived from the TPACK framework except that it specifically deals with VT rather than technology in general, as is the case with TPACK. The V-TPACK framework expands on the teachers' knowledge through recognition of the role of video technology in each of the teacher domains (V-PK, V-CK, V-TK, V-PCK, V-TCK, V-TPACK).

A novel collection of pedagogical processes, namely Video-Based Pedagogical Processes (VBPPs), are then introduced into this modified theoretical framework (V-TPACK). The VBPPs provides insight into a teacher's cognition and categorizes a teacher's internal thinking processes.

The modified theoretical framework (V-TPACK) not only provides a new perspective in terms of explaining the integration of teaching domains, VBPPs and VT. It may also act as a guide for teachers to the successful adoption of VT into their teaching thus resulting in teachers becoming curriculum planners who transform video-based media tools for pedagogical purposes. In other words, it provides teachers with the means to plan, integrate and deliver effective training programs with the use of VT.

A survey of school teachers in Jordan not only provides an understanding of the nature and extent of VT use by teachers in Jordan, but it is also the first step in understanding the integration of VT into V-TPACK domains in the context of Jordan. The next step of this research (to be considered in future works) is to conduct additional surveys based around V-TPACK and VBPPs to teachers in Jordan in order to further ascertain the nature and extent of integrating VT in teaching practices.

Whilst there are limitations to the V-TPACK theoretical framework and VBPPs, they are one possible combination of theoretical perspectives that may explain the relationship between the integration of VT and a successful pedagogical outcome. Therefore, the V-TPACK and VBPPs may be presented to Jordanian teachers in the future as a pedagogical roadmap to successfully integrate VT for optimal teaching outcomes.

It should be noted that an important aspect of the V-TPACK conceptualization presented in this study is that it focuses on VT in general. Focusing on the umbrella term "video technology" captures the plethora of video-based technologies used in teaching. Whilst this provides a better perspective on a broader spectrum, further studies

could focus on a particular type of VT such as (but not limited to) YouTube, Vimeo, and other video-based platforms. This perspective may be helpful in understanding the specific modalities of video-based technology in teaching and learning, which may further close the knowledge gap on this topic in the context of Jordan. This further study can be considered in future research efforts.

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Blended Learning Adoption in Higher Education: Presenting the Lived Experiences of Students in a Public University from a Developing Country

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ABSTRACT
The concept of Blended Learning (BL) is gaining widespread attention in Ghana as many public universities' switches into this delivery format. The paper investigates the BL experiences of students from a public university and among other things presents their views relative to the determinants of BL adoption and the barriers encountered out of the experience. The paper adopts a qualitative case study methodology and purposively interviews 15 students from a BL class of 57 students. The analysis was done using Thematic analysis techniques. The findings presented in this paper indicate that the students in the BL class hold a positive perception of BL. Insights into the perspective of the respondents show that students view BL as an approach that is convenient, flexible and among other things facilitate learning beyond the limitations imposed by the classrooms. Also, BL is viewed as an effective pedagogic tool that allows learning to take place in a socially constructive manner through the utility of Learning Management Systems. The contra-indications, however, are that inadequate infrastructure, internet connectivity in terms of cost and bandwidth as well as social distractions that affect students focus are viewed as challenges mitigating against students' successful adoption. The indications are that blended courses offer more convenience and flexibility than face to face delivery. These findings provide insights into the lived experiences of students that administrators and faculty members can tap into and when addressed will lead to successful BL implementations that ultimately lead to proving unique learning experiences and outcomes that students deserve and BL promises.

Keywords: Blended Learning, Thematic analysis, technology adoption, higher education institutions, Ghana.

INTRODUCTION
Higher Education Institutions (HEIs) are adopting Blended Learning (BL) as the teaching approach with increasing frequency (Bokolo et al., 2020). The literature abounds with several definitions for BL to the extent that congruence and agreement on a universally accepted definition of what BL is remains elusive. BL, in its simplest definition is the "integration of face to face and online teaching delivery" in combinations that ensure that the learner gets a unique learning experience (Medina, 2018; Taylor, Vaughan, Ghani, Atas, & Fairbrother, 2018; Wong, Tatnall, and Burgess, 2014). BL improves students learning satisfaction and outcomes (Owston, York, & Malhotra, 2019), reduces dropout rates (López-Pérez, Pérez-López, and Rodríguez-Ariza, 2011), stimulates critical thinking (Lin, 2018; Korkmaz and Karakuş, 2009), and promotes learner autonomy to study (Teo, Doleck, Bazelais, & Lemay, 2019; de Fátima Wardenski, de Espíndola, Struchiner, and Giannella, 2012). Not only that, but HEIs are also adopting and integrating BL into the teaching and learning curriculum because of its utility as an approach to address enrolment and competition challenges (Narh, Afful-dadzie, and Boateng, 2019). In addition, BL provides the opportunity for the academy to integrate academic workflow processes in a seamless manner that benefits all stakeholders in the institution. Stakeholders within the university include students, faculty, management, and external constituency actors that relate with the university herein termed as the industry (Bozkurt, 2012; Ansong, Boateng, Boateng, & Anderson, 2017).

Sloan Survey of Online Learning (2009) suggests an increasing number of institutions in the United States of America are integrating online and blended courses into their curriculum. However not the same can be said in developing countries even though BL has the potential to be a transformative delivery approach (Mtebe and Raisamo, 2016). Similar studies by (Awidi, 2008; Awidi & Cooper, 2015; Buabeng-Andoh, 2015) have recounted that universities in developing countries such as Ghana are transitioning gradually from traditional face-to-face to BL deliveries. Graham, Woodfield, & Harrison (2013) categorise universities integrating BL into their teaching and learning curriculum into three stages: (1) awareness/exploration, (2) adoption/early implementation, and (3) mature implementation/growth. Going by Graham's et al. (2013) tripartite stage model, universities in Ghana can be said to fall within the "adoption and early implementation stages" given that management of these universities have demonstrated that they are conscious of the potential of BL and have taken decisions to implement BL.

Ghanaian universities implementing BL face challenges such as poor Internet connectivity, inadequate infrastructure, poor facilitation conditions and lack of technical support, among others (Tawiah, Lamptey, Okyere, Oduro, and Thompson, 2019; Adam, Effah, and Boateng, 2019) and faculty and students resistance towards BL (Ansong et al., 2017). There is ample research focused on BL at the institutional level seeking to understand facilitating conditions and barriers towards the adoption of and integration of BL (Rasheed, Kamsin, & Abdullah, 2020). It will appear that implementing BL will require an understanding of students' perceptions and adoption determinants as this will provide a feedback mechanism to faculty who teach in the BL mode to design courses that stimulate and engage students. Whereas there is literature on students perceptions and adoption determinants (Owston et al., 2019; López-Pérez et al., 2011) very little from these exist that provide scholarship from a developing country's perspective (Asunka, 2017; Asunka and Freeman, 2019). Adekola, Dale, & Gardiner (2017) aver that while students' view of BL as an approach is found to trigger critical inquiry and stimulates exploration, the lack of homogeneity within the students' cohort create different expectations and experiences that need to be understood to satisfy students.

The success or otherwise of BL courses are evaluated based on students perceptions, expectations, attitudes, satisfaction as well as challenges (Joel S. Mtebe and Raphael, 2018; Tang, 2013; Chen & Tat Yao, 2016). BL programmes requires feedback from students to ensure a successful implementation of teaching-learning methodology (Shantakumari, 2015). This paper, therefore, explores the perceptions of students by asking of their experiences in a BL course. A series of qualitative interviews with students in a BL class from Ghana Technology University is used as a basis for understanding students' perceptions on BL relative to the benefits and challenges encountered in a BL program.

The paper is organized into the following sections: section two introduces the literature on student BL adoption while the methodology is presented in section three. The findings, discussions, and conclusions are presented in section four, five and six, respectively.

LITERATURE REVIEW

BL is viewed and understood differently, and it is often reported that the lack of congruence in definitions leads to misunderstanding and varied applications of the concept of BL. What constitutes a blend to institution A can be institution B normal delivery. Viewed as the "new normal" (Norberg, Dziuban, & Moskal, 2011) in higher education, the pre-eminence of BL as a preferred teaching approach has gained considerable research attention. BL is defined as a mixture of two archetypical teaching environments that is face-to-face and online delivery to harness the benefits of the two worlds in order to stimulate active learning and improve student learning outcomes (Allen, Seaman, and Garrett, 2007; Shand and Farrelly, 2018; Smith & Hill, 2019).

There have been positive reviews about perceptions of students doing courses in the BL mode. López-Pérez et al. (2011) studied the perceptions of students in a BL program in Granada during the 2009-2010 academic year. The students' perception in this study was positive. Teaching in the BL mode improved learning outcomes and reduced dropout rate in the class. Additionally, the study found that teaching students in BL mode increased their examination pass rates. Mtebe and Raphael (2018) assessed factors that lead to learner satisfaction and found that the quality of the instructors in the delivery program, the quality of the delivery system and the support service provided to students were responsible for learning satisfaction in students in a BL program.

Other studies have looked at the challenges students face while taking courses in the BL mode (Wu, Tennyson, & Hsia, 2010). Students in BL programs have been found to experience a sense of isolation which is associated with the frustration encountered where there is a lack of immediate feedback from instructors (Adekola, Dale, & Powell, 2017). Adekola et al (2017) find that students face the challenge of managing time during BL courses. Not only that, but they also find that faculty members using BL approach assume students have prior knowledge of courses which frustrates students. Technical issues related to system use and lack of support for students have been raised (Ssekakubo, Suleman, & Marsden, 2011). Additionally, self-efficacy relating to students computer usage has been found to impact on students' adoption of BL (Wu et al., 2010).

METHODOLOGY

The study is carried out in as a case study using a public university in Ghana that was established in 2005. The university has a student population of about 8000 students and runs degree and postgraduate programs. As part of its strategic vision to be a world-class university, the university in recent times (2013) adopted a BL policy and hopes that by 2021 BL would have been fully implemented campus wide.

Research design

Students in a BL course at the Faculty of Computing and Information Systems were used for the study. The course

was designed and structured to be delivered both online and face-to-face. The course was originally designed as a 40-hour modular course to be taken during the weekends for a month. After the re-design, two weekends were converted into a BL class thus reducing the face-to-face contact to 20 hours over two weekends. The course outline, lecture materials and videos were uploaded in advance into the university's (Moodle) LMS. Prior to the start of the course, notifications were sent to the students informing them of the format in which the course was going to be run. Learning materials and course outlines were also sent to the students. The lecturer facilitated the course by first holding face-to-face classes for the first two weekends and alternated with the blended format the subsequent weekends. During the BL format, the lecturer introduced the course online, posted assignments, questions on discussion forums, posted videos and shared links to further reading. Assignments were submitted through the LMS after running plagiarism check through Turnitin that was incorporated into the system.

Data collection

In all, fifty-seven students at the case study university registered for the course on the Moodle Learning Management System. With the assistance of the course instructor, 15 students were purposively selected and interviewed for the study. A semi-structured interview approach was adopted to allow for exploration and clarification of the respondents' views. The interviews were conducted face-to-face in the classroom during the period of the course (October to November 2017). The researcher was guided by Brinkmann and Kvale (2018) on the approach to do interviews. Each interview session lasted between forty-five minutes to an hour and was conducted between October – December 2017. With the prior permission of all the 15 respondents, the interviews were audio-recorded.

Data analysis

The audio recordings were replayed and transcribed into written text. The transcripts were emailed to the respondents to correct, clarify, and validate text as a true account of what was captured during the interviews. Thematic analysis (Plano Clark and Creswell, 2015) was used to analyze the data. This involved reading all the transcripts all over with the objective of getting immersed into the data to understand the lived experiences of the respondents. While reading the transcripts the text was broken down into chunks and assigned unique identifying tags called codes. The coding process was applied throughout the transcripts. In the process, several codes were generated. These codes were analyzed, compared, and grouped when they bore similar meanings or relationships with each other. They were subsequently abstracted for themes and grouped into tentative categories. To ensure rigor, reliability, trustworthiness, and credibility (Vaismoradi, Jones, Turunen, & Snelgrove, 2016) an external coder was employed to code five of the transcripts. The external coder was a faculty member with significant qualitative research experience who additionally was familiar with the content of the research. A coding framework was agreed on to ensure that the codes stayed in line with the research objectives. The findings were presented to the respondents to comment on as a way of enhancing research credibility. In the end, the participants confirmed the findings as representing the true account of their lived experiences.

FINDINGS

This section presents the results of the analysis involving interviews with the 15 students. The students were asked about what their perceptions are about being taught in BL mode. They were also asked about the challenges they face when taught in BL mode. The results yielded interesting insights into the determinants and barriers militating against the BL experience of students.

Overall, students expressed satisfaction with the BL experience albeit with some challenges. Most importantly, the respondents mentioned that the unique feature of the BL process lay in its utility to organize teaching and learning in a flexible manner and at the same time moving the boundaries of the teaching environment from the classroom to virtual spaces where a community of learners engage in knowledge-sharing and learning. According to an interviewee: "*there is more communication between all of us because everything is online, everyone is on social media, so it makes getting information much easier and getting access to lecture notes*".

Speaking very enthusiastically about BL as enhancing students learning experiences, the respondents indicated that BL platforms used in the delivery make learning easy while at the same time providing several possibilities that are not available in the traditional classroom environment. Speaking specifically to this, the respondents indicated that the learning management system platforms provide opportunities for storing lecture content, recall and retrieving of learning materials. In a sense, the respondents see the BL experience as complimentary to the face-to-face teaching as expressed by a respondent who opined that "*well as we've been saying the blended learning is a further enhancement to the regular classroom learning, suffice to say that if the classroom learning should have been a 100%, it's been added a 150% because I see it as an addition to what you've gotten from the classroom*".

Similarly, the respondents viewed BL as an effective pedagogic tool. The shared insights into these views are discussed in the following paragraphs.

Sharing their views on why they viewed BL as an effective pedagogic tool, the respondents were quick to always contrast the approach with the face-to-face delivery. In doing this, they indicated that learning through BL broadened the scope of avenues for accessing information. A respondent expressed the following sentiments "*Learning resources for courses can be sourced from multiple sources mainly through online, discussions with peers or colleagues on LMS discussion platforms and wikis etc*". Another respondent said, "*when it's online you can also get information from so many sources because it's online not only the teacher teaching you in the class but from wide sources*".

Some other respondents also viewed it from the faculty member perspective in terms of how they (faculty) use BL as a pedagogic tool. They make the point that teaching in BL mode advances learning by means of the opportunity that LMS platforms provide to faculty in aggregating or connecting students on a single platform without time or space limitations. This provision enables faculty members to adopt social constructivist teaching methodologies to facilitate teaching and help students to socially construct knowledge. To buttress this point, one respondent argued that "*my lecturer can create a post or forum group and engage us online so we can learn and exchange ideas there*".

Students also viewed BL as a better delivery approach relative to the timeliness in getting clarifications and feedback from lecturers when they needed one. For some of the respondents, getting lecturers to clarify or explain topics that have been treated in class was possible only when the course was due on the timetables or schedules. However, BL gave them unfettered access to their lecturers and opportunities to engage them on issues. Similarly, teaching in BL using LMS platforms facilitated quick and easy assignment submissions and prompt feedback from faculty members. In making this point, one interviewee said, "*we have an online platform for students sometimes the assignment is loaded up there and our tutors use it, lecturers use it to get feedback. I am reading through and if I am not getting something right I could message my lecturer from that platform and ask him with regards to a particular subject or topic that I don't understand, and he can also respond back at the same time, so my experience has actually been wonderful*".

The ultimate positive take-away for the students in terms of their perceptions and determinants of BL in their view was the extension of the teaching experience beyond the borders and confines of the classroom. Students held the view that BL was a teaching approach that transcended classroom boundaries and by this changed their orientation about learning. Hitherto, according to the respondents learning started and ended in the classroom. However, with the introduction of BL, it afforded them the opportunity to learn in unstructured learning environments enabled and facilitated through the medium of technology, "*the Moodle platform, it affords you the opportunity to learn outside the classroom because lecturers will be able to upload your lecture notes even ahead of time so you can go on the platform and download your lecture notes and you can read ahead*".

In terms of the challenges that students face in BL teaching environments, the results indicate that these are mainly related to inadequate infrastructure, perceived system design and security concerns, LMS platform challenges and its attendant lack of technical support from the University to address issues arising. The details are presented below:

The results indicate that Internet connectivity both on and off-campus presented a very difficult challenge for students. This, for many students, was a limiting factor that impacted their decision to use BL. Accessing LMS required internet connectivity. So, accessing the internet on campus was a challenge, it made it extremely difficult to access course materials and engage in discussions and follow lectures. More so, when students face internet challenges, they are unable to meet assignment submission deadlines. According to a respondent, "*There are times I am unable to submit my assignments because I run out of data or the internet is very slow, and I have to miss submission deadlines*".

The study also found that notwithstanding the positive reviews of the BL approach, students view BL as challenging relative to how to stay focused and learn giving all the environmental distractions available. Students reflected on the BL process and indicated that, it encourages self-studies and requires environments that were free from social distractions. For many of the respondents, focusing and paying attention on everything that goes around is very difficult. Respondents expressed thus, "*so focusing online or maybe it's a video call is difficult, you might get distracted by things around you maybe if you're in your room or something you have a roommate that might be playing music or something and really take your mind off what you're studying but it doesn't happen when you're in the classroom*".

Additionally, the lack of adequate user support was expressed by the students. In their view, giving that being taught in the BL mode was a relatively new experience, there was the need for orientation from the onset of their programs to guide students. The study found that the absence of such orientation thrust students into a pool of confusion and not knowing what to do. Registering for the course and using LMS functionality was challenging. A respondent remarked that "*I think with that coupled with the day to day interaction of the service by the students it's possible to find a way through but if you just enrol me and say I have uploaded an assignment: go and download the assignment how do I get along?" So, the students need to be orientated on how to use the system".*

Systems prompt and notification issues were also mentioned as a corollary to the lack of adequate support challenges. Students get lost navigating LMS, in some instance, they reported they were unable to get notifications or do not know how to access the platforms to access lecture materials or content that were uploaded by their lecturers. Respondents expressed this view as thus; "*Currently I feel if we would be getting notification alerts on the platform because normally not everyone has been checking in on the platform all the time but if it is so getting a notification that lets say maybe there is an assignment given or maybe there is something to do there should be sort of notification to remind you*".

The Table 1 below describes the results of the themes abstracted from the analysis of the data. A detailed discussion of the findings is presented in the subsequent section. The findings of this study indicate that teaching in BL mode is a novelty for the respondents interviewed. It was narrated that, prior to signing into the course, the notifications were sent for them to enrol onto the Moodle LMS. As a teaching approach, many of the students expressed the view that there was no prior information or orientation to prepare them towards the BL teaching approach. The feeling of being lost and helpless according to the respondents creates a great deal of anxiety for them. Especially, students with low computer and technology usage level require external support to help them navigate through the process. Thus, prior to signing up for courses, faculty or departments ought to gauge the students level technology so as orient them towards this approach. Again, a major disincentive that stands out from the table is the unreliable internet connectivity both on and off campus that disrupts online classes and affects student's performance especially if they have to use breakout room for group for discussions. Finally, about technological requirements, students indicated that face challenges on how they work together in the online environment. Faculty demands on students presents challenges. For example, as narrated by a respondent thus "*certain course demands that students have to have a working camera and microphone and should use a headset to reduce audio feedback*". Another respondent expressed that "*We use the chat function very selectively so you cannot rely on this*". In all these a stable internet connection and a quiet space for the duration of the class is required. However, these requirements may pose some challenges especially for BL course where participation in real-time is central to the process.

On the positive side, the students expressed the view that studying in BL mode makes teaching and learning much easier and fun them. Specifically, the LMS functionalities such as group chats on discussion boards, breakout rooms facilitate and enhances teaching. The students indicated that unlike in the face to face sessions, teaching in BL allows them to be more interactive with their peer during group work. However, while this was mentioned, respondents also expressed the feeling of isolation especially during discussion boards when faculty members do not respond to their questions. Also, the themes from the findings in the table indicate that students construct BL as an approach that utilizes LMS delivery medium which provides the platform to connect remotely to access educational resources, attend lectures and as a repository for the storage and retrieval of lecture material. Generally, the study found that the respondents viewed the BL approach as an effective pedagogic approach as it provided them with the unique opportunity to schedule their studies at their own pace, engage other students on virtual space by engaging the learning community that is created when LMS are used for the BL delivery.

Table 1 Themes and Sub-themes representing students' perspective of BL.

Sub-categories	**Categories**		**ABSTRACTED THEMES**
The slow pace of the internet	Campus connectivity	Platform remote accessibility	Platform accessibility
internet connectivity for students			
internet and basic introduction challenges			
accessibility	Student connectivity		
Remote location			

Retrievability recall opportunity	Ease of access to teaching materials	Platform ease of access	
reading in advance	Ease of learning	Platform learning possibilities	Effective pedagogic tool
Comfort			
room for correction of mistakes			
utility for correction that paper submitted			
extended classroom opportunity			
enhancement of student learning			
facilitates student's engagement and contribution to the discourse			
improving learning and teaching			
enhancement and complimentary			
Community of learning	Communal learning		creates communal learning opportunities
communal learning			
Presence of community of learners			
Collaborative learning			
Building a community of leaners			
convenience to use for students	Platform ease of use	Platform ease of use	Personalized utility for student learning
convenience to use			
comfortable to use			
ease of use by students			
Ease of work			

Field work, (Antwi-Boampong, 2020

DISCUSSIONS

The study investigated students' perceptions of a BL course. The inquiry was gauged against how the students' perceived the delivery approach as compared to a purely face to face course. It also sought to gain insights into the

challenges they faced during the BL experience. With respect to the perception of students who took the BL courses, this study confirms findings in the literature that indicate that students hold positive views of BL and prefer BL to purely face to face or online courses (Asunka, 2017). Five themes that emerged from the perspective of the respondents include a personalized utility for students' learning, community learning opportunities, effective pedagogic tool, platform accessibility and platform challenges. The themes are discussed in seriatim below.

With the course designed and structured to be delivered both online and face to face, the results suggest the students found it as an approach that allowed for the personalization of learning. In order words, the students in this case study were unanimously enthused with the delivery approach and expressed so much satisfaction with it. As a weekend class, the students found the delivery approach to be flexible and convenient. The results confirmed studies by (Owston, York, and Murtha, 2013; Owston et al., 2019) that suggest BL courses or programs create a more unique learning experience for students. For example, the students did indicate even though there was no face to face teaching in the two weekends after the first delivery they were actually very engaged with the course online through the social interactions that went on online on the discussion forums.

Also, the students indicated that irrespective of this, there was a shift from the classroom to a virtual environment whereby a community of learners was created to socially construct knowledge. Studies by (Arbaugh, 2019; Napier, Dekhane, & Smith, 2011) (Napier, Dekhane, & Smith, n.d.) have confirmed an enhancement of students learning outcomes due to the communal learning environment that allows students to discuss, engage and share ideas. Also, students learning is enhanced through the anonymity that learning in BL mode provides. BL delivery especially using LMS provides anonymity to students who hitherto would not talk or contribute to the class. Thus, it helps less outspoken and frontal students who are timid to speak publicly in class. The students mentioned that they are able to contribute to discussions on the forums and do not feel intimidated as would have been the case if they were to respond to questions or ask same in a face to face classroom environment.

Similarly, the students viewed the BL approach as an effective pedagogic tool. In the students' view, teaching in the BL mode made planning, design of courses, sending notifications and stimulating interaction among students as well as allows easier feedback from lecturers. "Good teaching practices need to be governed by pedagogical tools or principles as such, the success of BL is not a function of technology alone. Misunderstanding the underlying learning theories implicit in teaching with technology coupled with poor course designs according to (Moore & Benson, 2012) will inordinately lead to failure in harnessing the utility and affordances of teaching and learning in BL mode for both students and lecturers. Therefore, viewed as an effective pedagogic tool, BL extends the classroom environment, avails the students the opportunities to correct assignments and to produce quality work.

Overall, the study confirms studies in the literature that suggest that students find BL to be flexible and much more convenient. Thus, with this being the case the Ghana Technology University stands in a very good position to implement BL. However, the University needs to address challenges relating to inadequate infrastructure, increase campus internet bandwidth, provide student support services for students and address learning management platform challenges that students face. Similar recurrent issues of inadequate infrastructure, technological challenges in universities have been reported (Mirata, Hirt, Bergamin, & van der Westhuizen, 2020). Barriers like these affect students negatively of their BL experiences.

CONCLUSIONS

This study investigated the perceptions of students taking a BL course at a public university in Ghana. In a course redesigned to reduce face to face time, the study finds that students have a positive perception of BL. This confirms earlier studies indicating students prefer BL as compared to a face to face or online course. The themes generated from the responses indicate that students view BL as an effective pedagogic approach that is enabled by LMS, providing access to students to engage in a flexible and convenient learning environment with students in online learning communities. The findings of this study should be considered by institutional managers as they embark on BL transitions. This study contributes to the understanding of how students perceive BL especially from a developing country perspective. Giving the challenges of infrastructure and faculty resistance to adopting new technology, this study has found that students hold a positive predisposition to adopting BL. Thus, managers of universities should address the infrastructural bottlenecks that impact against student BL adoption to enhance the students learning experience. The limitation of the study is that it involved a small sample of students who were taking a course in BL.

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CA²JU: An Alternative Communication System Developed in Brazil for Children with Disabilities

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ABSTRACT
Education is a fundamental right of all, guaranteed in the Brazilian constitution and in the legislation of several countries in the world. In Brazil, Special Education targets people with disabilities and global developmental disorders. A disabled person needs certain supports, the demands for which are varied. One such demand relates to people with disabilities who have complex communication needs. The **CA²JU** software, an augmentative and alternative communication tool that helps children with complex communication needs, was developed to tackle this problem. Its sophisticated computerised devices can form phrases and sentences for its users and are made available in two access modes: Illustrated and Pro-Expanded. This work aimed to investigate the effectiveness of the **CA²JU** system in terms of implementing alternative communication among children with disabilities. The research analysed the software test with 39 participants between 5 and 12 years of age. The software test showed an average efficiency of 38% in grammatical expansion and ease of access. In both access modes, greater efficiency and grammatical expansion were used in the software than in the communication boards. The lack of ways to communicate will negatively impact students' educational experiences. Thus, the **CA²JU** software is a daily communication alternative for people with disabilities that can not only realise but also accommodate the most varied demands and social contexts, thereby contributing to the development of inclusive schools.

Keywords: software validation, school inclusion, augmentative and alternative communication, disabled children

INTRODUCTION
School inclusion/special education policies have been implemented in a heterogeneous manner in Brazil and across the world. It is well known that when students with disabilities enter school, specific problems, such as issues of accessibility, emerge. In such cases, services and resources that eliminate barriers must be offered so that students with disabilities can access learning. When inclusive public policies are adopted, assistive technology (AT) is used to guarantee the accessibility of people with some motor disabilities and/or dysfunction. AT fits within this framework, bringing innovative instruments and ways that guarantee the inclusion of disabled persons in various spaces (Bailey & Baker, 2020). AT is used to identify any item, resource, and/or service that helps the user increase, maintain, or improve his/her functional capabilities such as communication, mobility, and control of his/her environment (Brunner, Hemsley, Togher, & Palmer, 2017). Therefore, AT could enhance the functional abilities of people with disabilities and favour their inclusion in various social contexts (Boster & McCarthy, 2018).

AT comprises augmentative and alternative communication (AAC) that combines resources and/or services of advanced and basic technologies. Because motor disabilities can hinder speech, it is necessary to use advanced

technological features (Mngomezulu, Tönsing, Dada, & Bokaba, 2019) that can act as mediators between the user and the alternative communication system. Examples of such features are mice (hardware), which function as triggers since they fire signals that are interpreted by the software installed on the computer (O'Neill, & Wilkinson, 2020) and can select certain meaningful symbols and pictograms. Based on the selection of these pictograms, the user constructs his/her message and communicates with the interlocutors (Hervás, Bautista, Méndez et al., 2020).

AAC systems also provide individuals with access to a variety of linguistic concepts, while also facilitating the everyday use, which is important for the development of intrinsic communication skills (Aydin & Diken, 2020). When AAC users are proficient in a predominantly oralised environment but must use an expressive language system in another modality, certain aspects of language structure may be particularly difficult both receptively in spoken language and expressively in the aided communication. In addition to expanding the lexical system and determining the relationships between the meanings of the spoken language, users need to identify how the words in their lexicon relate to the external symbols provided to them. As they improve their understanding of the content of spoken language, AAC users are expected to become familiar with what their pictographic symbols represent, what they are, and, subsequently, how the syntactic relations between these symbols work (Bloom, Critten, Johnson, & Wood, 2020a).

Therefore, when discussing the implementation of AAC systems, one must consider the linguistic levels of comprehension and production through which children undergo the process of linguistic construction (Von Tetzchner, Launonen, Batorowicz et al., 2018). This work developed a computer software called CA^{2}JU for implementing AAC considering the different linguistic proficiencies of patients who need advanced technology for communication.

The development of this AAC software aimed to provide more effective communicative possibilities through pictographic symbols at a low resource cost, allowing access from conventional computers to smartphones and expanding the range of environments and social contexts (Von Tetzchner et al., 2018).

In short, this article aimed to investigate the effectiveness of the CA²JU (Macedo, Chella, Givigi et al., 2015) system in terms of implementing alternative communication among people with disabilities. In view of mentioned panorama, this study aimed to present the results of the tests about the effectiveness of the created system, CA²JU, regarding the implementation of AAC for people with disabilities. The driven reason of this study is the developmental of a software characterized by enhanced of grammar expansion of people that need Assistive Technology to communicate. During this study, we analysed types of sentence organizations and symbols that promotes potential to lead to endure linguistically the patients needs.

METHODS

This study employed a qualitative-quantitative crossover clinical strategy that consists of methods, techniques, and procedures that seek to describe and interpret the phenomena through meanings attributed to the lives of the subjects or any other person who shares the therapeutic setting (Campos, Alves, & Turato, 2015).

The precepts of the Ethics and Research Committee, involving human beings of the Federal University of Sergipe, Brazil, were respected throughout the study. The subjects were included in the respective study groups after the signing informed consent forms. The project was approved by the Research Ethics Committee of the Federal University of Sergipe under CAAE: 15822613.7.0000.5546.

Participants

Initially, participants were selected from the Clinic School of the Speech Pathology Therapy College Program of the Federal University of Sergipe and three state schools located in the same city to undergo the software tests. The selection was based on (1) the analysis of children's charts wherein their medical diagnoses were described, (2) the children's communication profile and general speech-language evaluation, and (3) a screening in which the aspects considered were the presence or absence of cognitive impairment and linguistics difficulties.

The inclusion criterion for this research were: subjects had to be aged between 5 and 12 years and had to have a diagnosis and communication profile that fit groups 1, 2, 3 or 4. In total, 39 children participated in the groups, as described in Table 1:

Table 1. Groups for the testing.

Group	Profile	Number of participants
1	Participants without orality and without intellectual disability	5
2	Participants without orality and intellectual disability	12
3	Participants with orality and without intellectual disability	14
4	Participants with orality and intellectual disability	8

Note: Description of the four test groups with number of participants per group

Group one (G1) comprised 5- and 12-year-old children who presented an absence of speech or significant speech changes and did not have a diagnosis of intellectual disability. Considering that the software was developed with the purpose of facilitating communication among people without orality, these subjects constituted the target audience for the integral use of this program in its two modalities and, consequently, for the tests carried out.
Group two (G2) comprised 5- and 12-year-old children who had absence of speech or significant speech changes. Thus, children who did not develop oral language and did not make use of it for communication, besides those presenting clinical diagnoses of intellectual disability, were included. G2 children with mild to moderate cognitive and/or intellectual disorders constituted this group. This group represents the public that can use CA²JU as a tool that enables communication, despite cognitive deficiency, due to the flexibility of the software regarding the linguistic level of the user.

Group three (G3) included subjects aged between 5 and 12 years without any type of alteration of oral and cognitive language; they were the control group of this study. On the other hand, group four (G4), which comprised subjects between 5 and 12 years with orality and intellectual disability, represented those who would not use the software because it requires oral language usage and is used for mild-to-moderate cognitive impairment.

Software: CA²JU Illustrated and CA²JU PRO-Expanded
The CA²JU software is an assistive tool that aims to facilitate communication among people with deficient oral language. Its basic functioning consists of the automatic conversion of natural text into digitalised pictographic symbols that are semantically related. This software was registered at the National Institute of Industrial Property (INPI) under the registration number BR 5120150010557.

All the pictograms used by the software were derived from the portal ARASAAC (Portal Aragonés de la Comunicación Aumentativa y Alternativa, 2020), whose project was financed by the Department for Education, Culture and Sport of the Government of Aragon and coordinated by the Directorate General of Innovation, Equality and Participation of this department. The pictograms are from to the work of Sergio Palao for CATEDU (http://catedu.es/arasaac/) under Creative Commons license.

In view of the different linguistic conditions of each user, the CA²JU was developed in two modes of equal execution but different possible applications. The first modality was named CA²JU Illustrated, and the second CA²JU Pro-Expanded.

When one types a complete sentence in CA²JU Illustrated, it is translated into a sentence composed only of pictograms of the keywords. In other words, it transforms words of semantic-lexical nature into pictographic symbols. Each pictogram is added to a sequence that will later be converted into a sentence. For this task, the software works with several techniques such as Stemming and Entity and Name Recognition, which makes it possible to erase and add pictograms based on their semantic relations (Santos, Medonça Júnior, Macedo et al., 2015; Pereira, Macedo, Chella, & Givigi, 2017). The CA²JU Illustrated should be introduced at an early stage for those who have never used any CAA system. The following figure (Figure 1) exemplifies the conversion of sentence 3.2. of the execution protocol typed in the text box into a pictographic phrase:

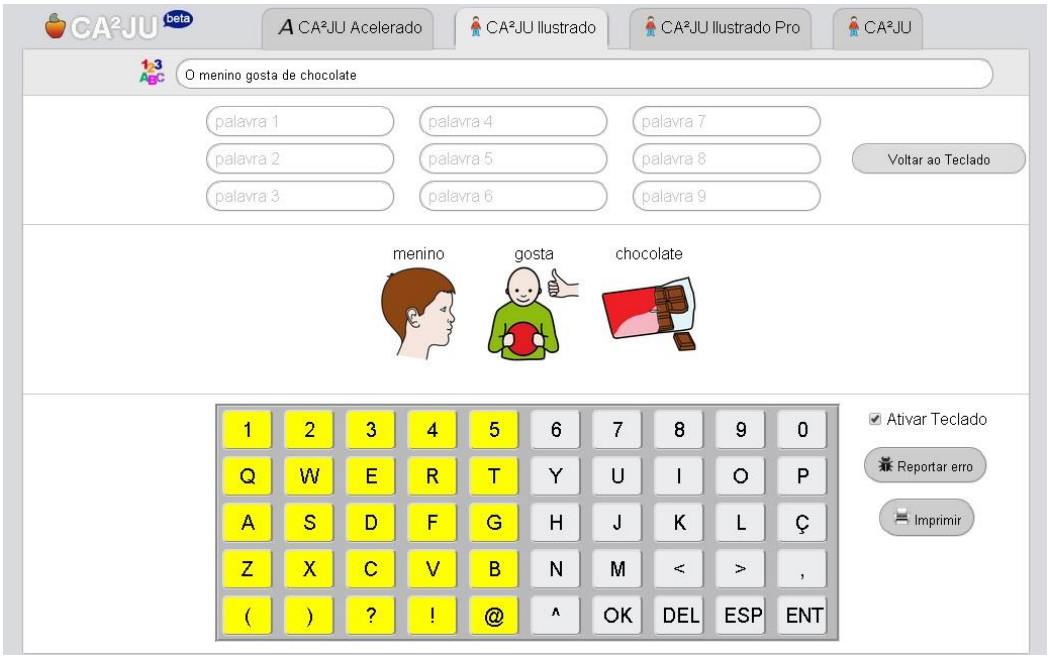


Figure 1. Conversion of sentence typed in the text box and converted into a pictographic frase. CA2JU Illustrated: Software.

The other mode of operation was called CA²JU Pro-Expanded. Unlike the CA²JU Illustrated the CA²JU Pro-Expanded mode allows the text to be transformed into pictograms with all elements represented in symbols, including semantic-grammatical elements. Figure 2 below exemplifies the result of the conversion of sentence 3.2. of the protocol of execution to a pictographic phrase.

Figure 2. Conversion of sentence with more elements typed in the text box and converted into a pictographic frase. CA²JU Pro-Expanded: Software.

Procedures

First, a study was carried out among the pilot group comprising six subjects in the age range of 5 to 12 years to determine parameters such as duration of the test, level of difficulty of interpretation of pictograms, and response options. Subsequently two study groups were established: CA²JU Illustrated and CA²JU Pro-Expanded. In the CA²JU Illustrated, the effectiveness of the software in the communicative function of the patient group was investigated through pictograms that were presented following the order of sentences recommended in the execution protocol. By typing a sentence in the CA²JU Illustrated mode, only words of a semantic-lexical nature

were transformed into pictographic symbols. In the Pro-Expanded CA²JU study group, the possibility of grammatical expansion was investigated, following the order of presentation of the phrases of the execution protocol. In this modality, the children were expected to change the structure of the sentence of the protocol of execution, besides using articles, prepositions, and adverbs, among others, which increased the level of complexity of the test.

The tests were conducted in two phases: one testing phase used the software CA²JU Illustrated and CA²JU Pro-Expanded, while the other used paper craft boards (AAC boards) made with the pictograms available on the ARASAAC software. These boards contained the same sentences used for testing the software.

After dividing the patients into the study groups, each group was divided in half in a non-randomised manner to determine which patients, the linguistic profile determined the groups, would start with the AAC board and which ones would start with the software. After the application of the test, starting with one of these instruments, the reverse was performed; in other words, the subjects who started with the software would respond to the AAC board, and the subjects who started with AAC boards underwent software evaluation. .

The non-validated execution protocol used in the tests comprised three sentence levels for morphosyntactic analysis (Appendix.A). All sentences were structured through a morphosyntactic study of the linguistic construction of the subject, relating age and context of the communicative functions. The first, second, and third levels contained common sentences to children aged between 5 and 8 years, 8 and 10 years, and 10 and 12 years, respectively. Thus, all subjects would start at level 1, whether or not they advanced to higher levels subsequently. Each level consisted of five sentences.

With regard to the evaluation, it was considered correct when the subject pointed out the image that corresponded to the meaning of the sentence from among the pictograms presented in the software and the AAC board. The subject passed to the next level if he/she had three or more correct answers.

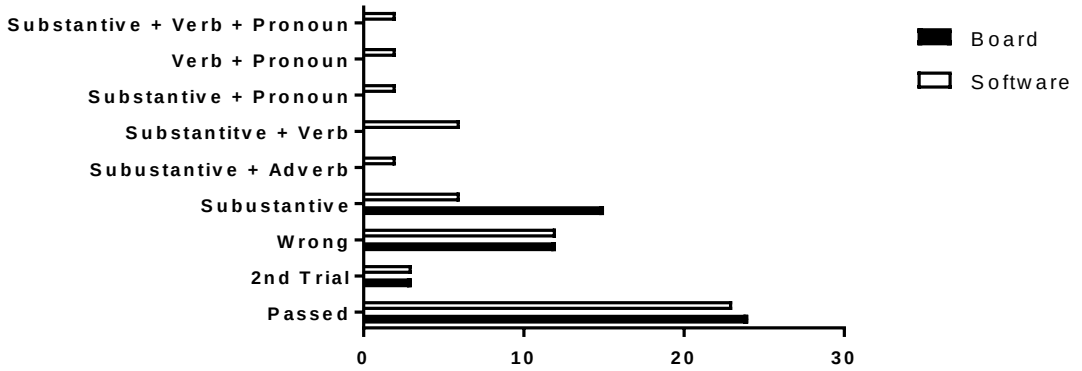
We established the following standard procedure for all tests: the subject assigned from among the group of children would start with the AAC board and then proceed through the software, beginning with the first level of the CA²JU Illustrated mode, which comprises the simplest functionality of the software. If the subject accomplished all requirements, he/she would be tested using the CA²JU Pro-Expanded mode.

All subjects were obliged to participate in the tests of the CA²JU Illustrated mode (board and software), but only those who fulfilled the requirements would continue to the CA²JU Pro-Expanded mode.

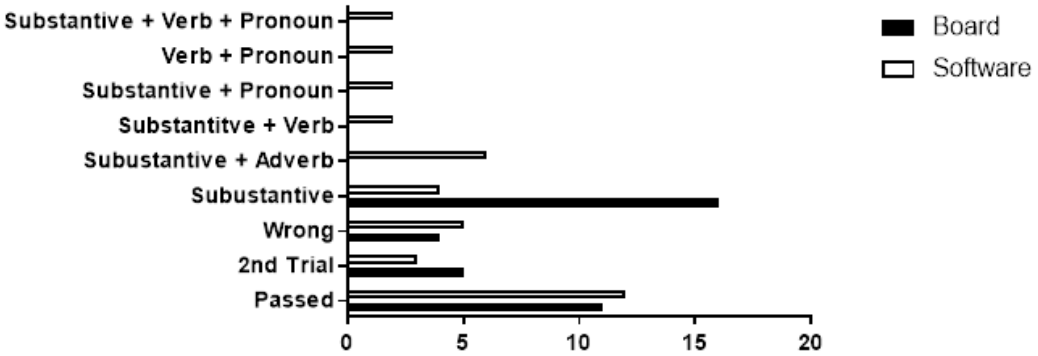
Statistical analysis
Collected data were entered into the Excel for Windows 2013 program data sheet and in the SPSS program, version 16.0. The Kappa coefficient was used to analyse reliability among rates and confidence intervals.

RESULTS
In total, 39 subjects participated in the test, and 38% progressed from the Illustrated mode to the Pro-Expanded mode. This data confirms the hypothesis that the subjects have to use the AAC for some time to be able to use the Pro-Expanded mode, which requires greater linguistic complexity than the former.

The units of pictograms for comprehension were more effective in the Illustrated mode than in the ACC. Regarding the grammatical expansion of the CA²JU Pro mode, a great variety of possible semantic combinations were found in the application, which is not possible with the paperboards, because they only consider the printed pictograms, while the software allows working with several grammatical classes using pictograms . It is noteworthy that in the Pro mode software testing stage, children are expected to change the structure of the sentence in the execution protocol in order to investigate the level of grammatical expansion of the program. Comparatively, in the testing phase of the boards, children are expected to modify the meaning of the sentence using only the options of answers in the boards, in order to compare the efficiency of the software in relation to the paper boards. This comparison showed the flexibility of the linguistic construction of the system in relation to grammatical complexity, a characteristic that is limited in the AAC boards. This result can be verified in the following graphs 1 and 2:

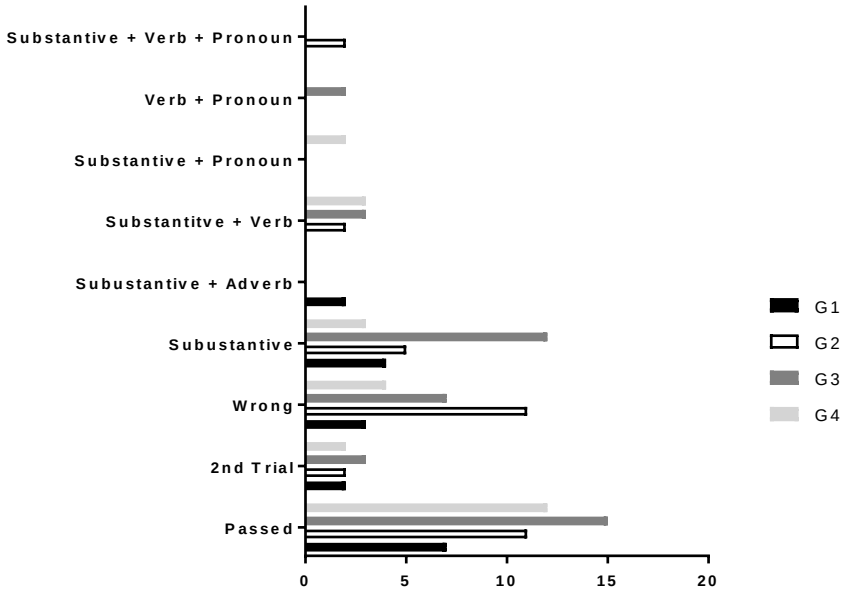


Graph 1. Graph showing the grammatical expansion between board mode and software, at the initial level of testing.

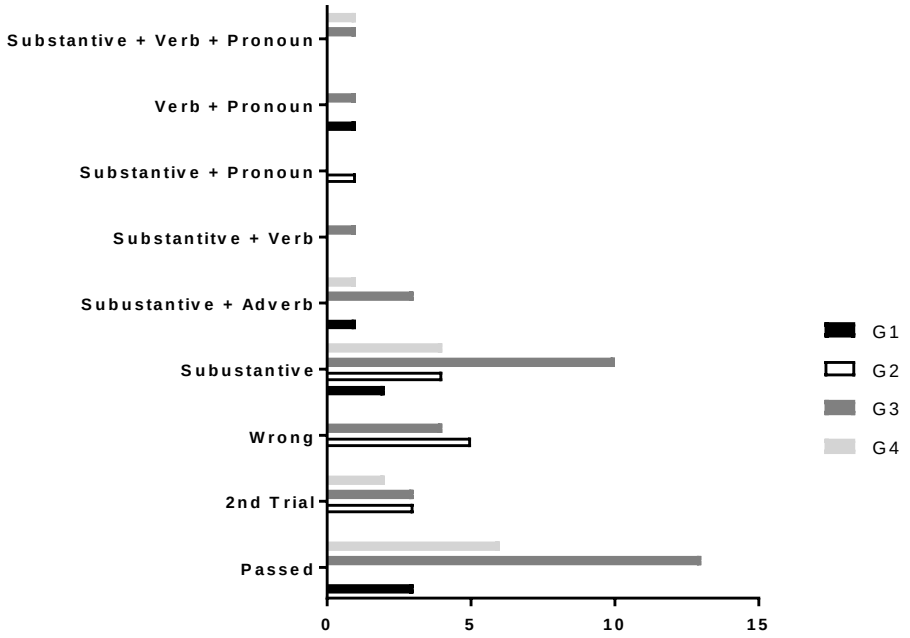


Graph 2. Graph showing the grammatical expansion between board and software mode, in the last sentence of the second level of testing.

Regarding the study groups outlined, it was observed that regardless of the origin of the subject – G1, G2, G3, or G4 – it was possible to perform grammatical expansion. Following are graphical analyses of grammatical amplification, regardless of mode (Illustrated or Pro-Expanded):



Graph 3. Grammatical expansion by groups, level 1.1.



Graph 4. Grammatical expansion by groups, level 3.5.

DISCUSSION

Although technological communication advancements are made worldwide, it is difficult to report the efficiency of the equipment and the consequent high cost. In 2013, a communication device was developed for people with disabilities based on advanced learning of cognitive, language, and user-learning skills (Yook, Oh, Lee, Go, & Bae, 2013). In addition, with regard to the interaction between man and computer, we can rely on ocular tracking devices to enhance the communication of disabled users with speech disorders or absence of speech, as the software was specially developed to meet such demands (Bekteshi, Konings, Vanmechelen, et al., 2020; Holmqvist, Thunberg, & Dahlstrand, 2017; Vessoyan, Steckle, Easton et al., 2018).

Currently, scholars have been working on the development of interface assessments of electrical signals on the scalp (electroencephalography EEG), or by means of electrodes implanted on the cortical surface in a surgical procedure, or through intracerebral electrodes (peaks of neuronal action). An important study verified the recognition of specific oscillatory patterns in multichannel electroencephalograms (EEGs). The ability to separate segments of real and imaginary movements during the EEG was verified (Pavlov, Grishina, Runnova, et al., 2019). Despite the advances, there are many outdated ones, such as cheap technology and physical enhancements in the performance of devices that use brain computer interface (BCI) (Uktveris & Jusas, 2018).

One of the major obstacles to the development of computer programs that offer AAC resources is the high cost and variety of aspects that must be addressed when it comes to language learning (Elsahar, Hu, Bouazza-Marouf, Kerr, & Mansor, 2019).

In British Columbia, Canada, a study investigated the sociodemographic characteristics of students with various special needs and disabilities. It revealed that, although profiles were heterogeneous, more than a quarter of those surveyed had one or more special needs. It was also noteworthy that within the same disability category, there was considerable diversity in its sociodemographic attributes (Lloyd, Zou, & Baumbusch, 2020).

In view of the obstacles described, it is important to consider the profile of users of alternative communication and their preferences in relation to the interlocutors who are involved in their conversations. Therefore, it is necessary that the alternative communication system is flexible to be most efficient (Boster & McCarthy, 2018). The CA^{2}JU software was built based on the linguistic levels through which children undergo the process of language construction. Thus, it was necessary for the tests to respect this relationship between the children's age and their linguistic level to guarantee the validity of the software validation as a communication tool for those with little or no orality.

Previous studies have verified the need for alternative communication resources that are flexible in language and syntactic strategies (Deliberato, Jennische, Oxley et al., 2018; Bonora, Dalai, De Rosa et al., 2019). At the end of the tests, the results showed that the CA^{2}JU satisfies the topic of syntactic-semantic flexibility because it allows the construction of sentences as the user selects a new item. The phrase that will be constructed can reflect what the user wanted to communicate because of the possibility of changing the pictograms; thus; it also allows the user to change the meaning of the whole sentence. This option was easily and quickly accessible to all groups, and all groups were able to perform this grammatical expansion, regardless of their diagnosis.

CONCLUSION

To be effective in school, individuals with complex communication needs require AAC resources. These resources enable interaction between peers and the students' participation in the learning process. Many studies have investigated the support provided to students with disabilities, reporting the importance of a variety of materials and modifications (Clark, Adams, Roberts, & Westerveld, 2020; Rose & Shevlin, 2020).

The development of CA^{2}JU software for CAA through the use of digitised pictographic symbols enables users with significant speech impairment to communicate with greater autonomy by sharing their wishes and desires.

Based on the 112 tests conducted, it is possible to consider the use of Illustrated and Pro-Expanded modes as a resource for everyday communication, since the software is not only online, allowing it to be accessed from conventional computers, smartphones, and tablets, but also effective in terms of the flexibility and semantic variability of pictograms, adapting to the demand of each subject. In addition to its everyday applicability, the software is an alternative, much like a therapeutic resource in the context of AAC implementation, facilitating the therapist's intervention with the subject who has similar communicative demands to those addressed in this study. However, the use of CA^{2}JU is not restricted to the therapeutic and domicile environment. The application of this tool as a means of communication in the school community opens a range of pedagogical possibilities aiming at the inclusion of the user in the activities that demand dialogues or even in the interactions among classmates, teachers, and other professionals of the school network. In inclusive education, when teachers are poorly supported, they are more likely to be unsuccessful. Of the various supports that are cited as important for the inclusion of the student in regular school are the communication resources (Saloviita, 2020).

This work is the result of a partnership with the Computer Sciences department. From their articulation of knowledge, it was possible to create a low-cost product that adapts to the subjects' communicative demands and have open standards for the purpose of enabling the interconnection with current software and hardware technologies. This mainly points to the possibility of people with disabilities to communicate and develop effective learning strategies.

Other research on using appropriate software or hardware systems and assistive technologies has shown that they contribute to learning and facilitate the interaction of students with disabilities. With the development of communication skills, such students can work in a team, solve problems, and participate in school activities (Bakken, Varidireddy, Uskov, & 2019; Drigas, Dede, & Dedes, 2020).

We argue that more work is needed to facilitate the communication of children and young people not only with disabilities but also with complex communication needs (Bloom, Critten, Johnson, & Wood, 2020b). In particular, we propose that other parameters be considered in the process of including children and young people with disabilities in schools.

There are many challenges for the development of communication tools for children with complex communication needs (Bloom et al., 2020b). However, there is a social and educational need to contribute to the construction of inclusive learning environments. Without communication, students will feel the negative impacts on their educational experiences.

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CONFLICT OF INTEREST

There are no conflicts of interest to declare.

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Appendix A

CA2JU ILLUSTRATED and PRO-EXPANDED TEST PROTOCOL

LEVEL 1

1. LET'S HAVE SOME ICE CREAM.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

2. THE GIRL WENT TO THE MARKET, BUT SHE DIDN'T HAVE ANY MONEY.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

3. GIVE ME SOME BLUE AND YELLOW PAINT TO COLOR THE FLAG.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

4. SIT CLOSE TO ME BECAUSE I WANT TO TALK TO YOU.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

5. DON'T FIGHT WITH THE BOY BECAUSE HE IS SAD.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

	CORRECT ANSWER	CORRECT ANSWER ON THE SECOND ATTEMPT	INCORRECT ANSWER
TOTAL POINTS			

LEVEL 2

1. I HAVE A BAD HEADACHE; I CAN'T STUDY.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

2. IT IS VERY COLD IN THIS CITY, SO THE MAN PUT ON TWO COATS TO AVOID GETTING SICK.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

3. YESTERDAY I DREAMED THAT A PRINCESS AND PRINCE FELL FROM THE TOP OF THE CASTLE.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

4. THE PARTY WAS TODAY. IF IT HADN'T RAINED, I WOULD HAVE RECEIVED MANY GIFTS BECAUSE I INVITED A LOT OF FRIENDS.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

5. WHY ARE THERE BIG PEOPLE AND SMALL PEOPLE? WHEN HE GROWS UP, HE WANTS TO BE BIG LIKE HIS FATHER.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

	CORRECT ANSWER	CORRECT ANSWER ON THE SECOND ATTEMPT	INCORRECT ANSWER
TOTAL POINTS			

LEVEL 3

1. IT IS GOING TO RAIN, SO DON'T FORGET TO CLOSE THE WINDOWS WHEN YOU LEAVE HOME TO MAKE SURE THAT THE FURNITURE DOES NOT GET WET.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

2. THE GIRL WOKE UP SO EARLY THAT SHE GOT TO CLASS BEFORE EVERYBODY ELSE AND HAD TO WAIT FOR THE TEACHER.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

3. LAST WEEKEND, I WENT TO GRANDMA'S FARM. I RODE A HORSE, SWAM IN THE RIVER, ATE MANGOES, DRANK MILK FROM THE COW, AND PLAYED WITH MY FRIENDS WHO LIVE THERE.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

4. WHEN SHE WAS A LITTLE GIRL, HER MOTHER TOOK HER TO SING IN THE CHURCH CHOIR, BUT SHE DIDN'T LIKE IT BECAUSE SHE FELT EMBARRASSED.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

5. HEARING THE BIRDS SINGING ON SUNNY DAYS CAUSED THE CHILDREN TO WAKE UP HAPPIER ABOUT GOING TO SCHOOL AND PERFORMING THEIR TASKS.

☐ Correct Answer ☐ Correct Answer on the Second Attempt ☐ Incorrect Answer

	CORRECT ANSWER	CORRECT ANSWER ON THE SECOND ATTEMPT	INCORRECT ANSWER
TOTAL POINTS			

Determining the Optimal Duration of a Single Lecture in Distance Education Using Facial Analysis of Instructors

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ABSTRACT
The Covid-19 Pandemic, which has affected the entire world profoundly, has given rise to changes in many areas. The change in the education system appears as a compulsory transition to distance education, which raises the question as to how long the lectures in distance education should last. This study examined the emotional changes of the instructors who teach in the distance education environment by analyzing their faces with the Facial Action Coding System (FACS). Through the software developed by the researchers, the emotions of the instructors were evaluated in terms of feelings of disgust, sadness, happiness, fear, contempt, anger, and surprise. For evaluation, 53,923 photographs were obtained from 149.8 hours of videos recorded in 288 sessions of 29 different courses provided by 9 instructors and 47,883 of them were analyzed. Based on the changes in emotions, the optimum lecture time in the distance education environment was examined. In addition, the study determined the effects of instructors, courses, programs, weeks of the course, students' attendance, lecture type, session information on emotional changes. The study revealed that instructors' negative emotions generally increased between the 11th and 20th minutes, whereas the negative emotions of the instructors who preferred to have a longer session decreased after the 25th and 35th minutes. The study revealed that all of the emotions mentioned varied according to instructors, courses and programs that some emotions differed significantly according to students' attendance and lecture type, and that week of the course and session information did not cause any emotional changes.
Keyword: Optimum lecture time, distance education, Facial Action Coding System (FACS), teacher's emotional change, facial emotion recognition

INTRODUCTION
Several extraordinary events in the world has caused serious changes in education systems. According to UNESCO (2020), more than 1.2 billion children in 186 countries across the world have been affected by the school closures during the current pandemic, and this has increased both the number of distance education users and its significance. It has been observed that distance education, which provides opportunities for individuals who are unable or unwilling to attend lectures in a face-to-face environment, is applied in various ways. While distance education is perceived as textual data by some students, for others, it means regular communication with students and instructors as well as specially-prepared study materials (Holmberg, 2005). Holmberg (2005) stated that some universities offer their students the opportunity to watch only recorded lectures during distance education, while there are other examples in which universities allow their students to communicate with instructors and other individuals via writing or on the phone. Even though distance education practices vary, lecture time in distance education environment is considered to be an important component of the education process. This period should be taken into account as regards both the student and the instructor. Although there is no analysis based on data in the literature as to how long online courses should last, many people with experience in this field suggest that a lecture should be no longer than 20 minutes (Hersh et al., 2001). In the study conducted by Hersh et al. (2001), virtually all of the participants found it appropriate to divide a lecture into 20-minute segments, while some students found this duration long, suggesting that a lecture should not be more than 15 minutes.

It is known that the attention of individuals decreases as time progresses in lectures in distance education environment. While it has not been possible to find any studies on instructor's attention span in the literature, studies on student's attention span are abundant. These studies determined similar attention spans close to each other. McKeachie (1986) argued that student's attention lasts 10 minutes, while Davis (1993) and Wankat (2002) suggested that it lasts 10-15 minutes. According to the study by Stuart & Rutherford (1978), it was determined that students' attention increased rapidly during the first 10-20 minutes of the lecture and then declined gradually. Johnstone and Percival (1976), on the other hand, argued that attention decreased in the first 5 minutes and that it continued for 10-18 minutes. In universities, lectures generally last nearly 50 minutes, but there are many authors who maintained that student's attention span is 10-15 minutes, and asserted that the lecture time should be limited to this duration (Bradbury, 2016). Since the attention span of the students is limited (Simon, 1957; Simon, 1971), it can be argued that keeping the duration of a session short will increase the attendance in online lessons.

There are also studies on lecture duration in formal education. Some of these studies deal with the determination of teachers' opinions. Caycı (2018) examined teachers' opinions as to whether a 40-minute lecture duration is appropriate in formal education. As a result of the research, while 45% of the participants find this duration appropriate, 15% think that the lecture duration should be reduced because of the fact that students' attention lasts 10-15 minutes. Gokçe (2012) assessed teachers' opinions on the adequacy of the current lecture length. While 61% of the teachers participating in the study found the lecture duration sufficient, 20% found it too long. On the other hand, some studies were conducted through student analyses. As a result of the studies conducted by Author (2017) with the analysis of students' facial expressions, it was concluded that students' attention to the lecture decreased between the 7th and 17th minutes, but this could be changed via the instructor's intervention, and also that it had no effect after the 25th minute and students' attention declined completely. Author (2020) found as a result of the facial analysis of the students that the feeling of contempt, which was thought to be related to the concentration level, decreased rapidly in the first 15 minutes of the lecture, whereas the feelings of happiness and surprise increased.

In a limited number of studies on the distance education environment, it was examined how long students were engaged in the lecture. Regarding the attention span of the MOOC (Massive Open Online Course) participants, Guo et al., (2014) determined that the engagement time is at most six minutes, regardless of the length of the video lesson, according to the six minutes' engagement time; and thus they recommended keeping the videos short. Lectures cannot be kept so short, sometimes because of the complex content of the subject and sometimes because of the fact that excessive workload to which preparing short video lectures will lead may not be preferred by the instructor (Geri at al., 2017). According to the study by Geri et al. (2017), students' attention span is longer than six minutes. Some studies on MOOCs found that the number of participants dropped significantly a few minutes after the video started, and emphasized the importance of keeping the lecture videos short. Guo et al.,(2014) argued that attention is lost after 6 minutes unless any stimulus is used. However, attention span of the participants can change according to the reasons for their enrolling in the course, and attention can be maintained even in 50-minute lectures (Lagerstrom et al., 2015). Lagerstrom et al. (2015) examined the duration of watching the recorded videos by undergraduate and graduate students in two separate computer science courses. The study revealed that the students watched a video for an average of 17-20 minutes in a single watching session.

During the literature search, no study was found about the attention time, optimal lecture duration and the effect of other lecture components in distance education regarding the instructor. In distance education, the instructor who will attract the attention of the student to the lecture through his/her communication skills has many substantial roles. Among these roles are being aware of students' autonomy, giving importance to their opinions, and taking individual differences into account (Isman & Dabaj, 2004). Anderson and Dron (2011) evaluated the roles of instructors in distance education in different pedagogical generations, and defined them as Content creator, sage on the stage (Cognitive - Behaviorist model), Discussion leader, guide on the side (Constructivist model), Critical friend, co-traveler (Connectivist model). Although having undertaken various roles in different pedagogical generations in distance education, the instructor is among the most important components in distance education environment. This study performed facial analysis of instructors, who have a considerable role in distance education, and examined their emotional changes. The emotions experienced by individuals are reflected in their facial expressions (Keltner & Ekman, 2000). Some expressions of the emotions felt by teachers can be observed by students and these observations may cause students to behave differently. Many studies revealed that teachers' emotions affect students (Sutton & Wheatley, 2003). Mayer et al. (2000) argued that emotions are among the fundamentals of mental functions. This suggests that being aware of teachers' emotions is essential to understand teachers and teaching process (Sutton & Wheatley, 2003). The aim of this study was to determine the optimal lecture duration by examining the emotions of the instructors. This examination was conducted through facial expression recognition. Facial expression recognition is known to be widely applicable to various research areas, such as mental illness diagnosis and social / physiological interaction detection (Samadiani et al., 2019). Detection of the face in the photograph, determination of components such as eyes, eyebrows, mouth, and nose on the face, and interpretation of their characteristics such as position and size are conducted with algorithms based on obtaining the emotional states as an output.

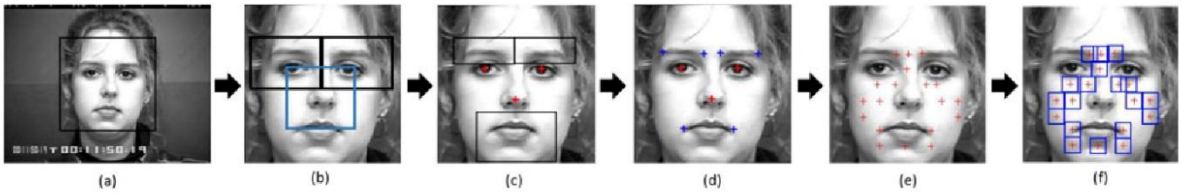

Figure 1. *Framework for automated facial landmark detection and active patch extraction (Happy & Routray, 2014).*

In such algorithms, the principles of the Facial Action Coding System (FACS) developed by Ekman and Friesen (1976) are generally used. With a few exceptions, it is known that all people have the same facial muscles (Schmidt & Cohn, 2001) and that different people's facial expressions express the same emotion. Feelings of contempt, fear, joy, surprise, sadness, and anger have been universally defined (Rolls et al., 1992). For this reason, universal emotions were recognized by analyzing the facial expressions of the instructors.

Considering the point that distance education has reached today, determining the optimal lecture duration based on the data will help to eliminate a deficiency in the literature. It can be argued that emotional changes of the instructor, who is one of the fundamental elements of distance education, is reflected in the students. Thus, it is essential for the sake of a healthier educational process that the instructor give a break or end the lecture without waiting for negative emotions to develop. The study conducted to achieve these purposes examined universal facial expressions of the instructor teaching in a distance education environment and sought the answers of the following questions:

1. How do the emotions of the instructor change during a lecture?
2. Do the emotions of the instructor differ significantly during a lecture according to the

    a. instructors,

    b. programs,

    c. courses,

    d. weeks of the course,

    e. students' attendance,

    f. lecture type, and

    g. session information?

METHOD

In this study, facial expressions of distance education instructors were analyzed using the Facial Action Coding System (FACS). Instructors' emotions were evaluated in terms of feelings of disgust, sadness, happiness, fear, contempt, anger, and surprise, via a software developed by the researchers using the C # programming language and the Microsoft Face Recognition API in the Visual Studio software development environment. In order to determine the facial expressions, a photograph of an instructor was taken from the recorded course videos every 10 seconds and analyzed with the abovementioned special software. Since totally visible faces of the instructors was a prerequisite for the analysis, each photo was examined and the analysis started only after excluding the photographs that were not suitable for the examination out of the 53,923 pieces of data. Except some pictures that the program could not analyze, a total of 47,883 pieces of data were included in the study.

WORKING GROUP

The study was conducted using 149.8 hours of videos recorded in 288 sessions of 29 different courses with 9 instructors teaching at distance education Vocational School in the spring semester of 2019-2020 at a state university in the Mediterranean Region. The instructors teach in six different programs, namely Computer Programming (CPR), Medical Documentation and Secretariat (MDS), Office Management and Executive Assistant (OMA), the Joint Program (JP), which includes all of these programs in the Vocational School, the Faculty Joint Program (FJP) for the common courses selected in different programs of different faculties and Vocational School Joint Program (VSJP) for the common courses selected in different programs of different Vocational Schools. 4 of the instructors are male and 5 are female. Two instructors have been teaching for 10-12

years, two of them for 5-7 years, five of them for 2-4 years in distance education environment. The age range varies between 30 and 40.

DATA ANALYSIS

In order to determine the changes in instructors' emotions according to different variables, firstly, the normal distribution of the data was examined. The suitability of the data for normal distribution is analyzed by several different statistical methods (Kim, 2013). These include kurtosis and skewness values (Tabachnick & Fidell, 2007). While some studies stated that kurtosis and skewness values should be in a certain range (George & Malley, 2003), some others evaluated the value formed by dividing kurtosis and skewness values by their standard deviations (Kim, 2013). In the study, it was determined that these values were not in appropriate ranges, that is, they did not provide a normal distribution; therefore, transformations were applied to the data set. However, in the analysis of the second sub-problem, since the data were not normalized as a result of the data transformations, the Mann Whitney-U test was used to analyze whether the median of two unrelated samples differ significantly; the "Kruskal Wallis H-Test for Independent Samples" was used for more than two samples and the Mann Whitney-U test was used to determine the reason for differentiations.

FINDINGS

Figure 2 shows median emotion changes based on duration and 47,883 photographs related to the question "How do the feelings of the instructor change during a lecture?", which is the first sub-problem of the study.

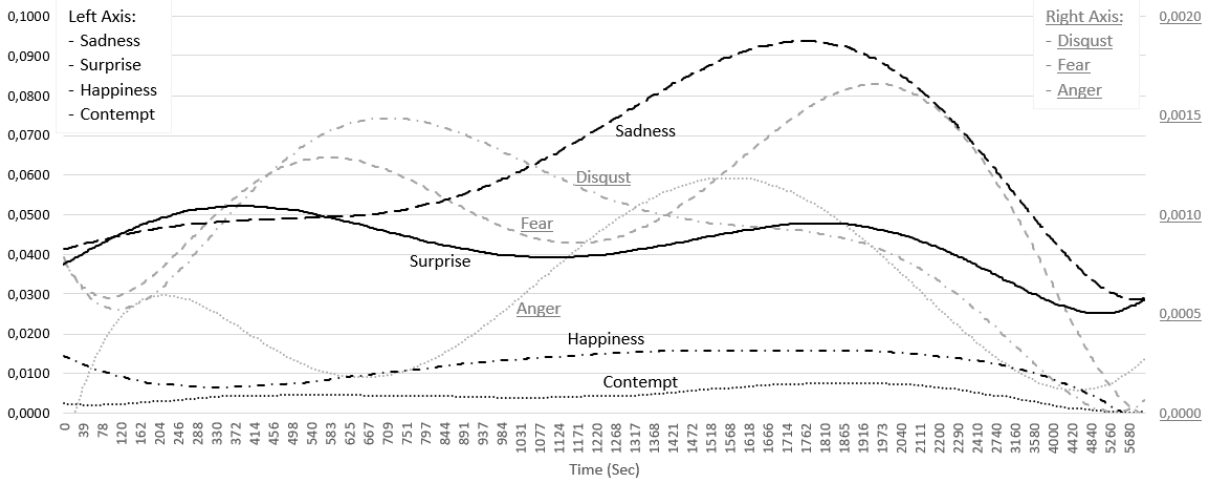

Figure 2. *The medians of the instructors' emotional changes during the lecture according to time*

Figure 2 shows the changes in the emotions of the instructors over time. The sum of all the feelings of sadness, surprise, happiness, contempt, disgust, fear, anger and neutral in the data produced as a result of the analysis conducted by the software used in the study equals to 1.0. The value of the feeling of neutral, which constituted the highest value in every photograph, was not used in the study because it was not considered to be related to the purpose of the study. The graph in Figure 2 was created with the median values of the same type data corresponding to the same second in the data set of other feelings. In the figure, the feelings of sadness, surprise, happiness and contempt are on the left axis, while disgust, fear and anger are on the right axis. The study revealed that the feeling of sadness gradually increased from the beginning of the lesson while increasing rapidly from about the 12th minute (751th sec) to the 30th minute (1810th sec). However, this feeling subsided rapidly after the 30th minute. The feeling of surprise increased in the first 5 minutes (288 secs) of the lecture, reaching the highest level between approximately the 6th and 7th minutes (330th-420th secs.) and then decreased until approximately the 20th minute (1220th sec.). With a following increase, it started to decline sharply from the 32nd minute (1916th sec.). The feeling of fear started to decrease at the beginning of the lecture, and from about the 2nd minute (120th sec.), it saw a sudden rise until about the 8th minute (498th sec.), then fell again until the 20th minute (1220th sec.) Afterwards, it rose significantly until approximately the 34th minute (2040th sec.) and then started to decrease again. The feeling of disgust fell down until the 2nd minute (120th sec.) in a similar way to the feeling of fear, and then rose until the 10th minute (583th sec.), following which it continued to drop constantly. The feeling of anger increased in approximately the first 4 minutes (246 secs) of the lecture, and then decreased until approximately the 11th minute (667th sec.). Afterwards, it rose until approximately the 25th minute (1518th sec.) and then saw a rapid decrease again. It started to increase after about the 80th minute (4840th sec.) again. The feelings of happiness and contempt did not see any sharp fluctuations. Happiness dropped at the beginning of the lesson until

about the 5th minute (330th sec.), after which it increased steadily until the 52nd minute (3160th sec). After the 64th minute, it saw a fall. The feeling of contempt saw minor fluctuations at the beginning of the lesson, with a slight decrease in the first seconds, and then increased from approximately the 21st minute (1268th sec.) to the 35th minute (2111th sec.), after which it declined.

The study examined the effect of different factors on the change of emotions which constitutes the second sub problem. First of all, Kruskal Wallis H-Test was used to determine whether the emotions of the nine instructors who participated in the study changed according to individuals. Mann Whitney U-test was used to find whom the difference resulted from. As a result of the analyses, the study revealed that, **regarding instructors**, there were significant differences in the feelings of anger (X^2 (sd = 8, n = 290) = 156.889, p <.05), contempt (X^2 (sd = 8, n = 290) = 188,175, p <.05), disgust (X^2 (sd = 8, n = 290) = 211.046, p <.05), fear (X^2 (sd = 8, n = 290) = 188.947, p <.05), happiness (X^2 (sd = 8, n = 290) = 161,129, p <.05), sadness (X^2 (sd = 8, n = 290) = 191.024, p <.05) surprise (X^2 (sd = 8, n = 290) = 213.430, p <.05). The source of the difference in the feeling of anger was examined and it was found that each of the instructors with the codes of BS, OD, AO, and SD differed significantly from the instructors with the codes of OP, MA, BO and KA; the difference in the feeling of contempt was between MA and BO, KA, OD, IG, BS, as well as AO, and also between OP and KA, OD, IG, BS, aside from AO. When each emotion was examined in terms of instructors, it was determined that the source of the differentiation was different and there was no regularity in this differentiation.

The same analyses were used for the change in the emotions of the instructors according to the six different programs. As a result of the Kruskal Wallis H-Test, it was determined that, **regarding programs**, there was a significant difference in the feelings of anger (X^2 (sd = 5, n = 290) = 95.812, p <.05), contempt (X^2 (sd = 5, n = 290) = 105,776, p <.05), disgust X^2 (sd = 5, n = 290) = 101.884, p <.05), fear (X^2 (sd = 5, n = 290) = 38.306, p <.05), happiness (X^2 (sd = 5, n = 290)) = 77.531, p <.05), sadness (X^2 (sd = 5, n = 290) = 70.531, p <.05) surprise (X^2 (sd = 5, n = 290) = 20.155, p <.05). Via the Mann Whitney U-test, it was determined that the difference was between the programs of CPR and MDS, OMA, JP. In the lectures in CPR, it was observed that the values of anger, contempt, disgust, fear, sadness, surprise were lower than in the other three programs, while the value of happiness was higher. It was determined that the values of contempt, disgust and happiness were lower in OMA than in FJP and JP.

According to the analysis in 29 courses, it was determined that there was a significant difference in the emotions of the instructors. As a result of the Kruskal Wallis H-Test, it was determined that, **regarding courses**, there was a significant difference in the feelings of anger (X^2 (sd = 28, n = 290) = 165.664, p <.05), contempt (X^2 (sd = 28, n = 290) = 205.553, p <.05), disgust (X^2 (sd = 28, n = 290) = 219.539, p <.05), fear (X^2 (sd = 28, n = 290) = 199.103, p <.05), happiness (X^2 (sd = 28, n = 290) = 173.906, p <.05), sadness (X^2 (sd = 28, n = 290) = 199.006, p <.05) surprise (X^2 (sd = 28, n = 290) = 218.015, p <.05). It was determined that these differences resulted from seven courses, Mobile Programming, Computer Package Programs, Object-Oriented Programming, New Technologies in Health, Open Source Operating System and Network Basic, all of which are taught in CPR. Significant differences were identified between these courses and the other courses in the program based on verbal knowledge. It was determined that the value of anger was higher in Mobile Programming (MPr) and Object Oriented Programming (OOP) when compared to many other courses, while this value was lower in Computer Software Packages (CSP) than in four other courses. The value of contempt was determined to be higher in New Technologies and Mobility in Health (NTMH) than in 8 other courses, higher in MPr than in 6 other courses, lower in Open Source Operating System (OSOS) than in other 10 courses, and lower in Network Basics (NB) than in 2 other courses. The value of disgust was found to be higher in OOP than 6 other courses, higher in NTMH than in 10 other courses, higher in MPr than in 3 other courses, and lower in OSOS than in 12 other courses. The value of happiness is lower in NTMH than in 6 other courses, higher in NB than in 9 other courses and higher in OSOS than in 9 other courses. The value of sadness is higher in NTMH than in 7 other courses and lower in OSOS than in 9 other courses. The value of surprise is higher in NTMH than in 5 other courses and lower in NB than in 9 other courses.

Whether the instructors' emotions changed in the courses that lasted for six weeks according to weeks was examined with the Kruskal Wallis H-Test and it was determined that, **as regards weeks**, there was no significant difference in the feelings of anger (X^2 (sd = 5, n = 290) = 2.693 p> .05), contempt (X^2 (sd = 5, n = 290) = 1.783, p> .05), disgust (X^2 (sd = 5, n = 290) = 1.550, p> .05), fear (X^2 (sd = 5, n = 290) = 3.007, p>. 05), happiness (X^2 (sd = 5, n = 290) = 5.204, p> .05), sadness (X^2 (sd = 5, n = 290) = 3.039, p> .05) surprise (X^2 (sd = 5, n = 290) = 5.477, p> .05),

In distance education, it is known that while students sometimes attend lectures synchronously, they sometimes do not. Whether the **attendance of students** in the lecture affects the emotions of the instructor was examined

with the Mann-Whitney U-test; it was determined that the feelings of anger (U = 16,091, p <.05), contempt (U = 16.437, p <.05), disgust (U = 16.348 p <.05) and sadness (U = 17.445, p <.05) changed significantly, and the values of these feelings were higher in the absence of students. There was no significant difference in the feelings of fear (U = 20.010, p> .05), happiness (U = 18.647, p> .05) and surprise (U = 22.689, p> .05) as regards students' attendance.

Depending on whether the lectures are theoretical or with practical application, the change in emotions was examined with the Mann-Whitney U-test; it was determined that the feelings of anger (U = 5.052, p <.05), contempt (U = 8.283, p <.05), disgust (U = 6.282 p <. 05) and sadness (U = 8.020, p <.05) changed significantly and the values of these feelings were higher in theoretical lectures. There was no significant difference in the feelings of fear (U = 11.003, p> .05), happiness (U = 12.106, p> .05) and surprise (U = 12.442, p> .05) **as regards lecture types**.

Instructors completed some lectures in one session, and some in two sessions by having a break. The change in emotions as regards session information was examined with the Mann-Whitney U-test; it was determined that there was no significant difference in the feelings of anger (U = 19.123, p> .05), contempt (U = 19.369, p> .05), disgust (U = 19.909 p> .05) fear (U = 19.511, p> .05), happiness (U = 19.654, p> .05), sadness (U = 20.545, p> .05) and surprise (U = 19.091, p> .05) **regarding session information**.

RESULT AND DISCUSSION

In this study, the facial expressions and movements of the nine instructors in 149.8 hours of videos recorded in 288 sessions of 29 different courses that continued for six weeks in the distance education environment were analyzed with Facial Action Coding System (FACS) and evaluated via a software developed by the researchers using the C # programming language and Microsoft Face Recognition API. For this purpose, 53,923 photographs were obtained by taking photographs of the instructors from the offline video records of the lectures every 10 seconds. Since some of these photographs could not be analyzed, the analysis of the universally accepted feelings of disgust, sadness, happiness, fear, contempt, anger, and surprise (Ekman & Friesen, 1976) were conducted with a total of 47,883 photographs.

Via face analysis, the study determined the change as regards duration in the emotions of the instructors who taught in the distance education environment. It was observed that, although they varied for different periods, the feelings of sadness, surprise and anger increased at the beginning, while the feelings of fear, disgust, happiness and contempt decreased. It can be concluded that the instructors might have had a serious attitude at the beginning of the lecture in front of the screen, and this assumption is supported by the fact that, especially in the first minutes, happiness decreased, while sadness and anger increased. The fact that the feelings of fear and disgust decreased until about the 2nd minute and then increased until approximately 8th-10th minutes suggests that after the greeting/introduction phase of the lecture, negative emotions occurred in the instructors while introducing the subject, and that they recovered after they dominated the lecture. It was observed that the feeling of fear generally increased during transitions. The study revealed that negative feelings, though not at the same durations, increased rapidly with significant changes between the 11th-19th minutes. The feeling of sadness rose significantly after the 12th minute, anger after the 11th minute, and fear after the 20th minute. The feeling of sadness subsided after the 30th minute, surprise after the 32nd minute, fear after the 34th minute, anger after the 25th minute, and contempt after the 35th minute. That is to say, sadness, surprise, fear, anger, contempt declined after about the 25th-35th minutes. In the study carried out in 29 courses, it was determined that the instructors completed lectures in sessions that usually lasted 25-40 minutes, and that some lectures lasted longer, as shown in Figure 2. The analyses conducted were evaluated on the basis of medians. In the 25-40 minute lectures, negative emotions went up between the 11th and 20th minutes, whereas they mitigated in the extra time of the lectures. It can be argued that there was a fall in negative emotions after the 25th-35th minutes in lectures which lasted longer due to the preference of the instructor. The finding that the emotions changed significantly according to the instructors also supports this assumption. Considering the average values of all lectures, it was observed that the instructors' negative emotions increased between the 11th and 20th minutes, and that they rose even more between the 25th and 35th minutes. Similarly, the study by Author (2017) also determined that students' engagement time in the lecture declined between the 7th and 17th minutes due to the elevated negative emotions. Similar studies on student engagement time also indicated the 10-20 minute interval (Bradbury, 2016; Davis 1993; Johnstone & Percival, 1978; McKeachie, 1986; Wankat, 2002). The study by Lagerstrom et al., (2015), which revealed that the students watched lecture videos for 17-20 minutes, also supports our findings. The data in the study regarding emotional changes are consistent with those in other studies. For instance, in the study by Author (2020), in which the changes on students' faces during the lecture were examined, the changes in students' emotions are quite similar. It can be maintained that the feelings of anger and happiness show almost the same change, including their durations, and that their change patterns are very close to each other even though the initial changes in the feelings of contempt

and sadness are different. This indicates that people who learn or teach in different teaching environments experience similar feelings.

As a result of the analysis, it was determined that the feelings of anger, contempt, disgust, fear, happiness, sadness and surprise differ according to the instructors. When the reason for this differentiation is examined, it was determined that each emotion changed in a different way in different individuals and this change did not occur in a certain pattern. This suggests that emotional changes depend on the reflection of the personal characteristics of individuals. The emotional responses of individuals in different situations vary from individual to individual (Duyan et al., 2011). Tamir et al. (2007) argued that the way individuals regulate their emotions varies. Similarly, Nilsen (2016) suggested that human emotions can differ according to individuals.

This study determined that the emotions of the instructors examined during the courses taught in six different programs varied according to the programs. In CPR, based on numerical knowledge, the values of all emotions except happiness were lower than in MDS, OMA and JP, based on verbal knowledge. Considering that emotions such as anger, contempt, disgust, fear, and sadness are negative feelings, it can be argued that instructors experience positive feelings more intensely in the programs based on numerical knowledge.

As a result of the analysis carried out in twenty-nine different courses, it was found that there was a significant difference in the emotions regarding the programs. When the reason for this difference was examined, it was determined that negative emotions such as anger, contempt, disgust, and sadness were experienced more intensely in the NTMH course, taught for the first time in CPR, and in OOP and MPr courses, taught for 3 years, when compared to many other courses. On the other hand, in the courses (CSP, OSOS, AT) having a complete content and taught by the same instructor for years, positive emotions such as happiness had a higher median, whereas negative emotions had a lower median than other courses. It can be argued that the course content had an impact on the instructor's emotions. Similarly, among the factors affecting the quality of online education is rich and quality course content, namely, learning-teaching resources and materials (Chao et al., 2006). Seaman (2009) argued that one of the factors that cause negative emotions of instructors is the low quality of course materials. This study also revealed that instructors had negative emotions in the lectures, the content of which was not developed sufficiently.

It had been aimed to examine the emotional changes of the instructors during the lectures throughout a semester. However, as the pandemic process started in Turkey after the sixth week, the instructors had to teach their classes from their homes and preferred not to share their own images in most lectures. For this reason, the images of the instructors were limited to six weeks, and it was found that they did not experience a change of emotion during this process depending on weeks. It can be assumed this was due to the fact that the instructors were experienced in distance education.

The study revealed that while students' attendance in the lecture created significant differences in the feelings of anger, contempt, disgust, sadness, it did not create a significant difference in the feelings of fear, happiness, and surprise. Due to the absence of students, the feelings which differed significantly were experienced more. Therefore, it can be claimed that student's attendance during the lecture generally reduced negative emotions. Bolliger and Wasilik (2009) suggested that students' performance and engagement during the lecture in distance education has a positive effect of on the satisfaction levels of the instructors. Similarly, this study revealed that the students participating during the lectures affected the positive emotions of the instructors.

The courses analyzed are divided into two: theoretical courses and the courses with practical application on a software. When the emotions of the instructors were examined according to the type of the course, it was clear that negative emotions such as anger, disgust, contempt, and sadness were experienced more intensely in theoretical courses, and that there was no significant change in the feelings of fear, happiness, and surprise. It is assumed that the courses with practical application can enable the instructor to feel more positive emotions.

It was observed that while the instructors gave a break in some lectures after 25-40 minutes, and then continued to teach in the second session, in some lectures, they completed the lecture in a 50- minute-single session without a break. The study showed that, generally, each instructor had a unique style and the break they gave were approximately at the same time interval every week. The significance of the emotional changes according to the sessions was examined, and no significant difference was found.

Based on the results of this research, the following recommendations are proposed. It is significant that lectures in the distance education environment not be longer than 19 minutes in order for the instructors not to reflect their negative emotions to the students. In this regard, it is recommended that instructors should not allow lecture

duration to exceed 20 minutes. In courses based on verbal knowledge, the lectures can be organized in a way to increase positive emotions. It is essential that the prepared course content should be of high standards. Distance education students can be encouraged to attend the class.

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Digital Storytelling in L2 Writing: The Effectiveness of Storybird Web 2.0 Tool

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Abstract
In the beginning of the 21st century, computer-assisted instruction dominated most of the fields of language education. Within this frame, writing has evolved in second language education as a result of technological changes. There has been a great number of studies on the benefits of computer assisted writing. On the other hand, some studies suggest that writing on computer has drawbacks, especially for creativity and originality. In order to make contribution to this ever-lasting debate, this study hypothesizes that computer-assisted writing has a positive role on generation Z (Gen Z). In a study by Adobe (2016), Gen Z students are found to see tech and creativity as an important and intersecting aspects of their identities.

This case study explores the Turkish middle school students' experiences on the integration of a digital storytelling tool called Storybird in their English classrooms. The current study is conducted at a state school with the participation of 6 students who are in 8th grades. The main goal of this research study is to discover the students' overall reflections on writing English through Storybird web 2.0 tool. The data is collected through pre-and post-open-ended questionnaires, observations, and pictures. The results show that Storybird has a positive impact on the students' perspectives towards L2 writing. Accordingly, it can be deducted from the findings that Storybird can be used as an effective digital tool for enhancing L2 writing in an EFL classroom.
Keywords: Digital Storytelling, L2 Writing, Storybird, EFL learners, Gen Z

Introduction

Among the other four skills, writing is generally seen as the most demanding one by foreign language learners (Damavandi, Hassaskhah, & Zafarghandi, 2018). Also, learners who do not prefer the traditional pen and pencil way for writing even become more discouraged. These learners are specifically referred to as Gen Z learners when their ages are taken into consideration. People who are born and raised in similar years and historical environments are categorized into similar generations (Hernandez-de-Menendez, Diaz, & Morales-Menendez, 2020). Learners who are considered as Gen Z born between 1995 and 2010 (Rothman, 2014). These learners are born with technology, and it is quite usual for them to use dijital applications in their everyday life. Now, teachers are obliged to learn the way of their students' communication style (Prensky, 2001). Accordingly, making the writing skill more technology integrated and interesting for those learners becomes a popular topic for the researchers.

Digital storytelling is one of the many ways of making L2 writing interesting and technology integrated into EFL classrooms. Nuñez (2017) defines digital storytelling as "telling and sharing of short stories (3-5 minute) accompanied with recorded sound (such as narration or music) and digital images (p.72)." Many studies support the idea that digital storytelling tools can enhance L2 writing (Damavandi *et* al. 2018; Balaman, 2018; Nguyen, 2017; Nazri, Shah, Yunus, & Zakaria, 2016). Nowadays, one can find various digital storytelling tools online and many educators utilize them in classrooms to enhance the literacy skills of foreign language learners (Towndrow & Tereira, 2018). *Storybird* is one of the online digital storytelling tools used by millions of teachers and students around the world as it provides an engaging writing setting for learners. High-quality visuals, guiding for writing and its user-friendly interface seem appealing for teenagers. The tool allows its users to write and publish their stories. Correspondingly, it enhances collaborative learning as it enables getting feedback from teachers and experts.

There are a larger number of studies on digital storytelling tools and their effect on EFL learners (Rance-Roney, 2008; Robin, 2008; Sadik, 2008; Towndrow & Tereira, 2018). However, the number of studies on the perspectives of EFL learners using digital storytelling tools for writing is rather low (Wertz, 2014). Moreover, the reviewed literature identifies only one study that focuses on the students' experiences with Storybird in an EFL classroom which is conducted in Malaysia with university-level students (Nazri *et* al., 2016). There is not a significant study dwelling on the Turkish students' experiences with the digital storytelling tool used for improving their L2 writing in an English classroom, though. The main aim of this paper is to explore the middle school Turkish students' experiences in writing English by using an online digital storytelling website named *Storybird.*

Literature Review

As it is stated in the introduction part, there have been a great number of research studies on digital storytelling demonstrating the positive impact of it particularly in L2 contexts (Sadik, 2008; Damavandi *et* al., 2018; Robin, 2008; Balaman, 2018; Rahimi & Yadollahi, 2017). Researchers have been discussing the use of digital tools on multiple counts involving literacy skills, technology engagement, etc. (Rahimi & Yadollahi, 2017; Robin, 2008). On the other side, there have been studies concerning the students' perspectives on using digital storytelling tools in EFL classrooms (Castañeda, 2013; Nasri *et* al., 2016; Damavandi *et* al., 2018). In the following paragraphs, the recent literature related to using digital storytelling in EFL/ESL contexts to increase writing skills will be discussed.

Mentioning certain definitions of the notion of digital storytelling can be a good way to start to examine the concept and what it includes. The Digital Storytelling Association (2002) defines the term as a modern version of traditional storytelling. Another description states "digital storytelling is a technology application that is well-positioned to take advantage of user-contributed content and to help teachers overcome some of the obstacles to productively using technology in their classrooms (Robin, 2008, p.222)". Castañeda (2013) summarizes the term as an integrative process that encompasses various types of technological materials like pictures, photographs, videos, audios to create a powerful and sentimental story. Studies have shown that there are many pros of affiliating digital storytelling with education such as engaging students with the learning process, building authentic activities, and increasing students' interest in the subject matter (Gils, 2005). Although all of the definitions seem to differ from each other, they reach an agreement on the positive effects of using digital storytelling in classrooms.

Damavandi *et* al. (2018) investigate the development of 15 EFL learners after using a digital storytelling tool named *Storyjumper*. The students' ages range from 15 to 17 and they are intermediate level students. The study has lasted for three months and the students are divided into two groups as a control group and an experimental group. Data is collected through pre and post-tests, semi-structured interviews, and students' reflective journals. Quantitative and qualitative data analysis is used in the study. The results recommend that *Storyjumper*, a digital storytelling tool used in the study, has a great potential for improving EFL learners' writing skills.

Similarly, Balaman (2018) compares the effects of digital storytelling on L2 writing with the conventional way of L2 writing. 43 university-level students whose ages range from 18 to 25 participate in the study. 31 of the students are female and 12 of the students are male. The researcher uses an experimental design by separating the participants into two groups as the control group and the experimental group. While the control group takes traditional writing instruction, the experimental group uses digital tools such as WeVideo and a video-editing tool. The treatment lasts 14 weeks. The data is collected by pre-and post-tests and a rubric. It is concluded that although both types are influential in improving L2 writing, L2 writing instruction with digital tools is more effective than the conventional writing type.

Rahimi & Yadollahi (2017) are the other researchers who focus on online digital storytelling to advance EFL students' literacy skills. The researchers question if there is a different impact of producing a story with an online digital tool in comparison to its offline counterpart. 42 first- grade high school students whose ages range from 13 to 14 are the participants of the study. Key English Test is conducted for measuring the proficiency level of the students and the IT literacy scale is fulfilled by the learners. The major finding affirms the favorable power of online settings to improve the participants' reading and writing skills.

Castañeda (2013) has conducted a case study searching for the effectiveness of digital storytelling in a foreign language classroom. Questionnaires, semi-structured interviews, focus groups, and observations are utilized as data collection tools. "This study's findings assert that digital storytelling can serve as a viable means to achieve meaningful goals in the foreign language classroom (Castañeda, 2013, p.56)"

Lastly, Nazri *et* al. (2016) dwell on the experiences of 15 diploma students using Storybird as a digital storytelling tool in their ESL classrooms. Questionnaires and interviews are used as instruments in the study. Authors suggest Storybird for EFL classrooms for increasing the students' reading and writing skills. It also comes out that Storybird motivates the learners for collaborative working.

Previous research accepts the digital storytelling tools as one of the most effective means utilized in classrooms especially in EFL settings (Robin, 2008; Sadik, 2008). Moreover, Hewitt & Scardamalia (1998) promotes collaborative digital writing for encouraging students to write as the activity is not limited to classroom hours.

Research Questions

The purpose of this study is to explore the middle school Turkish students' experiences in writing English by using an online digital storytelling tool called *Storybird*. With this goal in mind, this study addresses the questions below:

1. What are the participants' former perspectives on using a digital storytelling tool?
2. What is the participants' overall experience while using Storybird?
3. Do the participants' perspectives on digital storytelling tool change after using Storybird?

Methodology

Research Design

This research study follows a qualitative method for exploring the participants' experiences while using the digital storytelling tool called Storybird. Pre- and post- open-ended questionnaires and the researcher's observations are utilized to find out the learners' practice and their thoughts.

Participants

6 female students who are in 8th grades take part in this case study. Their ages range from 13 to 14. 5 of the participants are Turkish native speakers and 1 participant is a native speaker of Uzbek and Persian. While 5 Turkish students are 14 years old, the Uzbek student is 13 years old. 5 of the participants are Turkish native speakers and 1 participant is a native speaker of Uzbek and Persian. This bilingual participant has come to Turkey when she was 5 years old, and then she commenced primary school in Turkey. She has been taking her formal education in Turkish for 8 years. However, she has been raised by parents who do not know Turkish very well. Yet, the Uzbek participant is fluent and proficient in Turkish. All of the participants have taken the English course at state schools so far. They have taken the English course since they were 4th grades students. Each year, they have been exposed to English instruction for a minimum of 2 hours and a maximum of 6 hours. The participants' English proficiency levels are mixed. A former LGS (High School Entrance Exam) exam is administered as a standardized test designed and validated by MEB (Ministry of National Education) to determine the participants' English level.

Instruments

LGS exam as standardized test:

In order to determine the participants' level of English, the researcher decides to use MEB's former high school entrance exam questions. The rationale behind using this examination is that the participants are preparing for LGS this year and they are familiar with the question styles.

Storybird as a digital storytelling tool

The researcher decides on the Storybird website to generate digital stories. The major ground using this website is that Storybird has a very handy interface and it provides great visuals to its users. Although the website is not free of charge, 30 days are allocated as a trial period and it is quite sufficient for the realization of the study. Also, a free assignment 'Friends Forever' is elected by the researcher as real life like implementation in an English classroom would be in that way.

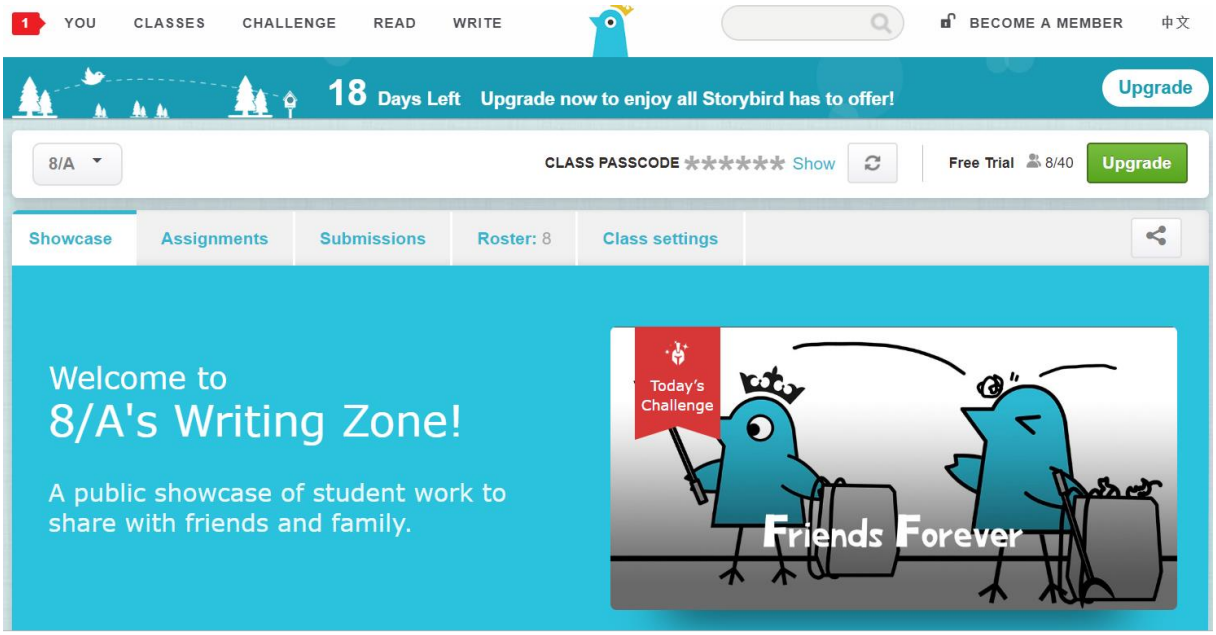

Figure 1: Storybird as a digital storytelling tool

Procedures

Because of the limitations in time and resources (Tongco, 2007), the purposive sampling method is conducted for investigating the participants' experiences with the digital storytelling tool 'Storybird'. The study is announced to the participants by the researcher (their English language teacher). It is indicated that it will be a non-compulsory supplement to the course. The study is conducted in four weeks and sessions take place during class hours. The duration of each session is 40 minutes. The LGS proficiency test is conducted in the first session. Then, the researcher distributes the pre-project open-ended questionnaires to the participants to be able to collect data considering their initial knowledge and thoughts about digital storytelling.

In the following session, the researcher introduces the Storybird to the participants and gives detailed information about how to use the tool. The researcher generates a class on the website named 8/A and gives the credentials to participants for signing up. After that, a writing task under the head of 'Friends Forever' is assigned. The students do not have the opportunity to do assignments out of the school as they do not possess personal computers and internet connections. Also, there is not a computer lab facility within the school. Therefore, the researcher allocates 30 minutes for each student by enabling them to use the researcher's computer for writing their stories. After all of the students finish and publish their stories. Then, the researcher reads the stories and gives feedback to each participant.

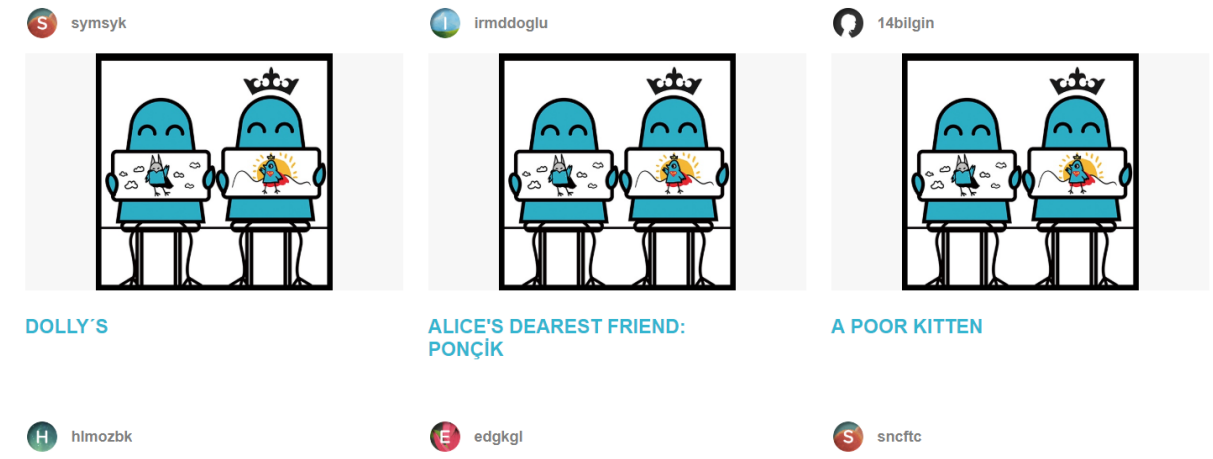

Figure 2: Covers of the participants' digital stories

At the end of the sessions, the researcher conducts a post-project open-ended questionnaire to the participants to obtain more information about their experience and reflections about writing a story on a digital platform. It should be noted that the language of the questionnaires conducted before and after the study is Turkish. The rationale behind using Turkish is to increase the participants' ability to express how they perceive their new learning experience and explain their inner thoughts about it.

Data Analysis

The data is collected through pre-and post- open-ended questionnaires and observations during the sessions. The questions asked in the questionnaires are generated based upon existing literature on digital storytelling. The responses are collected and analyzed through thematic coding. Both the observations and the responses given by the students help to determine basic themes and to interpret the answers. For the sake of anonymity, the participants are assigned codes as P1, P2, P3, P4, P5, and P6. Additionally, participants' ages and their nationalities are specified in parentheses.

Findings

Former perspectives on digital storytelling

1. What are the participants' former perspectives on using a digital storytelling tool?

The data collected from the pre-project questionnaire helps to answer the first research question. It gives basic information about the participants' background knowledge and thoughts about digital storytelling. The responses to what they know about digital storytelling are somewhat similar. The participant P2 and P6 have had a misconception that digital storytelling is like a search engine giving information about any topic.

- "A story that gives information in online platforms" (*P2, Turkish participant, age 14).*
- "It helps to examine research studies…" (*P6, Turkish participant, age 14).*

The questions are asked for inquiring about participants' initial concerns about writing a digital story. There is a wide range of answers. Three participants stated that they feel anxious about writing a digital story. One of the participants confesses that she is somewhat comfortable with telling a story on a digital platform. The other two participants indicate that they are quite excited and curious about this new experience. However, all of the participants are worried about writing in a foreign language. They state that they have language concerns and they are afraid of making mistakes while writing English. Harmer (2001) puts forward that "computer screen frequently allows students to see their writing more objectively" (p.261). Likewise, in this study the participants have conveyed their point of view thoroughly.

- "Firstly, I'll be afraid of telling a story in English as many people will be able to read my story. However, I will manage to be confident about it" *(P1, Turkish participant, age 14).*
- "I think it will be quite fun. Writing in a second language may improve my intellect" *(P2, Turkish participant, age 14).*
- "I'm excited about writing a story in English. I have never tried it before. It is worth trying" *(P3, Turkish participant, age 14).*
- "No, I'm not sure that I can tell a story in English. I am not comfortable with it" *(P4, Uzbek and Persian participant, age 14).*

It should be noted that the prudence of the participants in the study are similar to each other although they are different in certain aspects. "Our understanding of a task before we commence doing the work can affect the process we are going to embark upon" (Castañeda, 2013, p.52).

Overall experience with Storybird

2. What are the participants' overall experiences while using Storybird?

In order to answer the second research question, the post-project questionnaire is conducted after the participants submit their stories to the researcher. Generally, the participants mostly denote the ICT problems they have confronted during the task. Problems related to internet connection are also mentioned by participants.

- "I haven't done a task by using a computer before. That's why I struggle with the project" (*P5, Turkish participant, age 14).*
- "I lost the internet connection and my battery died. It caused the extension of time" (*P2, Turkish participant, age 14).*
- "I haven't got much experience with computers, so it was hard for me to manage the task" (*P3, Turkish participant, age 14).*

Final perspectives on digital storytelling

3. Do the participants' perspectives on digital storytelling tool change after using Storybird?

Findings show that all of the students are proud of their stories. One of the major theme found after analyzing the responses is publishing. All of the participants reveal that they are excited about publishing their stories as real readers may read and like their stories. It can be concluded that the participants' previous concerns related to digital storytelling have changed after using the website.

- "I felt like an author. I was proud because everybody can see and read my story" (P5, *Turkish participant, age 14)*).
- "After I published my story, someone using Storybird liked it. It was amazing" *(P2, Turkish participant, age 14).*
- "When I shared my story, I saw that there were people who were reading and liked it. I was proud of myself" (*P1, Turkish participant, age 14).*
- "Writing a story in English was the thing that I was proud of. I wrote a story and published it on a website. Maybe, I will be a good writer in the future" *(P4, Uzbek and Persian participant, age 13).*

Discussion

This case study explores students' experiences in English writing and perceptions of utilizing Storybird as a digital storytelling tool. The major findings of qualitative data support that Storybird is a good tool for encouraging the participants to write in their foreign language. The previous perspectives on digital storytelling have differed after they have got familiarized with the tool.

As the main problem stated by the participants is technology literacy, it should be considered to instruct them in this field systematically before conducting such research studies. Many studies are supporting the idea that using technology improves learners' language skills (Damavandi *et* al. 2018; Balaman, 2018; Nguyen, 2017; Nazri, Shah, Yunus, & Zakaria, 2016; Harris, 2011). Therefore, the participants' technological literacy should not be ignored in favor of the results of a study.

The results of data analysis also support the idea that having a real audience creates an authentic language learning environment. Moreover, the opportunity to publish the stories on Storybird and sharing them with other readers create a sense of ownership. Similarly, Damavandi *et* al. (2018) find that the participants take advantage of the *'constructivist nature of the digital storytelling'* (p.69) and they take responsibility for writing their stories.

Conclusion

The present study is a small-scale case study and it is limited both in time and in technological facilities. However, the observations and the responses of the participants given in questionnaires represent a high level of discernment considering the digital storytelling practice. The findings of the study posit that Storybird is an effective tool providing learners a real-life environment in foreign language classrooms especially in writing sessions. Furthermore, having real readers within the website motivates the participants for accomplishing their tasks and it creates a real publishing setting for them. Finally, the collected data reveals that the previous concerns of the participants related to language and technology have switched to positive feelings such as satisfaction about their story.

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Appendicies

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Appendix A

Pre-Study Open-Ended Survey Questions

1. What do you think of digital storytelling?
2. Have you ever come across an online digital story? If yes, can you describe it briefly?
3. What do you know about digital storytelling?
4. What kind of technology / technological applications do you use?
5. How comfortable do you feel when using these various technologies?
6. How do you feel about telling a story in English? Do you feel comfortable with that? Please explain.
7. How do you feel about telling a story about yourself in English? Do you feel comfortable with that? Please explain.

Appendix B

Post-Study Open-Ended Survey Questions

1. What were your technological problems in digital story writing?
2. What were the challenges of writing stories in English for you?
3. Was it a positive experience for you to use technology when writing stories? Why?
4. Was writing the digital story in English a positive experience for you? Why?
5. What technological challenges have you faced when writing digital stories?
6. What challenges have you encountered in terms of language when writing digital stories?
7. What was the part of the digital story you wrote that you were most proud of or loved?

Evaluation of Online Education Delivered by the Universities During Pandemic COVID-19: A Case of North Cyprus

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Abstract
Universities skipped from face-to-face education on campuses to online education worldwide due to the outbreak of COVID-19 started in December 2019. But it remains unclear how effective online education was, given that most instructors and students had little experience with online education and with lack of technological resources. This study aimed to evaluate the online education offered by the universities during Pandemic COVID-19. Mixed research was conducted with randomly selected 500 university students and 24 instructors from various universities in North Cyprus between April 2020–August 2020. Students agreed with the 30 benefits of online education, and they stated serious obstacles that they faced during online lectures. Instructors mentioned their online teaching experiences and the obstacles they faced during the pandemic. Also, participant instructors made some suggestions for the government, universities, and instructors to improve and ensure the effectiveness of online education. This type of in-depth research can be carried out by all universities globally and the data will help all education leaders and management of the universities to determine the weak and strong points of their online education and re-manage and redesign their online education to meet the needs of students. Universities can produce solutions to mitigate their problems in online education and increase the quality of online education which can be accessed by all students.
Keywords: Education Management; Higher Education; Instructors; Online Education; Pandemics; Students; Total Quality Management;

Introduction

There is an ongoing global outbreak known as COVID-19 caused by SARS-CoV-2, a new strain of coronavirus that causes some types of the common cold and Severe Acute Respiratory Syndrome (SARS). COVID-19 was first identified in Wuhan, China in December 2019, spread to 188 countries and territories. The outbreak of COVID-19 has been declared a Public Health Emergency of International Concern (PHEIC) and it continues to spread without differentiating between borders, age, gender, ethnicities, or disability status. Although many of the symptoms can be treated and there are several clinical trials that are being conducted to evaluate potential therapeutics for COVID-19 (Unicef,2020).

The outbreak of COVID-19 has caused social, economic disruption and affected education highly by impacting approximately 98.6% of the student population of the world. Schools, colleges, and universities have been closed in 161 countries (Unesco,2020) to prevent the spread of COVID-19. School closures have affected not only the students and teachers but also families worldwide. School closures have impacted over 60% of the student population of the world by resulting in some disruptions in education. COVID-19 outbreak has interrupted learning of students, caused poor nutrition of students who rely on healthy and free meals provided at schools, struggling of parents to facilitate the learning of their children at home, challenges of creating, maintaining, and improving distance learning, increased pressure on schools to remain open, rise in dropout rates and challenges in measuring and validating learning due to postponing or skipping calendered assessments and high-stake examinations (Unesco,2020). Online education was very ineffective in most of developing and underdeveloped countries (Adnan & Anwar,2020). It is a fact that teachers have had to adapt to universal distance education, but

there is a reality that most teachers and their organizations lack the skills and equipment to provide distance education effectively (International labor organization,2020). Many digitally developed countries have made different effective attempts and successful delivery of online classes to their students(Basilaia & Kvavadze, 2020; Zhou et al.,2020). In some developing and well-developed countries, schools followed alternative learning pathways after a short-break such as homeschooling, TV programs, radio programs, or other types of online learning. Many countries have turned to distance education to mitigate the loss of learning by using different teaching strategies. Schools in China, Italy, France, and Germany have delivered education to the students fully online and mobile phones or televisions have been used in Vietnam and Mongolia. Other countries such as Lebanon sent students home with lessons as homeworks; the government in Bulgaria created over 800,000 accounts for all teachers and parents, and publishers opened their digital textbooks and learning materials for students in grades 1 to 10 (Azzi-huck and Shmis, 2020).

During the COVID-19 crisis, all the universities closed their campuses temporarily with the order of the government to prevent to spread of COVID-19 in mid-March 2020 in North Cyprus. Most of the students returned to their home countries. After a 15-day break, the universities skipped from face-to-face education on campuses to online education. Instructors offered different types of online education to their students, such as synchronous or asynchronous, by using different online learning platforms from March 2020 to the end of June 2020. Some universities offered online courses as a summer school from June 2020 to the end of August 2020. Most of the students experienced online education without previous knowledge. Some instructors had prior experience with online education, but the others received help from technology teams in their universities and learned how to teach online in two weeks. Education is one of the top priorities now and the quality management of education during and after the outbreak crisis is urgent. Policymakers and educational administrators may use the COVID-19 outbreak crisis as an opportunity to introduce new learning modes that can reach every student and to prepare for emergencies (World bank,2020). Online education becomes more prominent in higher education and needs more attention and adequate investments of institutions, instructors, and students (Bao,2020).

Focus on expectations of stakeholders of education and their involvement in continuous development (Sallis, 2002; Al-Ibrahim, 2014; Bunglowala and Asthana, 2016), identifying needs and expectations of students about the quality of school services (Gruber et al., 2010) and high service quality delivery (Ene and Tatar, 2010 ; Militaru et al., 2013; Sweeney, 2016; Senol and Daglı, 2017) of institutions are the key principles of Total Quality Management in education. Educational institutions that provide quality services will achieve higher success, and they will be preferred if they design their programs to meet the needs and expectations of their students (Demirtaş & Kahveci, 2010). Schools should concern with the quality delivery of online education to support and advance the 21st-century skills of their students. It is time to share the experiences and take the opinions of the main stakeholders of education-students and instructors to learn what worked well and what didn't and reorganize online teaching to ensure the quality of learning in safe environments as a priority of the quality management of education. A few recent research analyzed the challenges and also the opportunities of e-learning during Pandemic COVID-19 (Mailizar et al., 2020). Some researchers emphasized the advantages of online learning experienced by the students during Pandemics, and some mentioned the problems faced by the students and teachers. Future in-depth research studies into online education are needed, especially concerning students (Zhang,et al.,2020) to explore the challenges of online education that hinder students' achievement (Mailizar et al., 2020) and the quality of online learning (Basilaia & Kvavadze, 2020). Based on the data, universities may detect their deficiencies in online education and speed up reform of online education by designing innovative course content, efficient management, and state-of-the-art technology (Sun et al.,2020).

Research Methodology

Aim of the research

This research aimed to evaluate the online education delivered by the universities during Pandemic COVID-19 in North Cyprus. In this light, answers to the research questions were sought:

RQ1: What are the perceptions of the students about the benefits of online education?
RQ2: What are the obstacles faced by the students during online learning?
RQ3:Which online platforms did the instructors use during the Pandemic?
RQ4: Which type of online education did the instructors offer during the Pandemic?
RQ5: Which type of adaptations did the instructors make in course content and duration of the course?
RQ6: Which strategies did the instructors use to motivate their students and increase student engagement?
RQ7: How did the instructors evaluate the online learning of their students?
RQ8: Which online resources did the instructors use?
RQ9: What are the obstacles faced by the instructors?
RQ10: What are the suggestions of the instructors to increase the efficiency and quality of online education?

Sample
Randomly selected 500 university students and 24 university instructors of various universities in North Cyprus were the participants of this study. For the students included in the sample, researchers also examined the background features such as the gender (59% male, 41% female), age (52.2% between 21-26, 40.6% between 26-30, 5.8% between 31-35, %1 between 36-40 and 0.4% between 41-45), department (health sciences-29.6%, sports sciences-18.6%, psychology-16.8%, engineering-13.8%, dentistry-8.8%, mathematics-4%, pre-school teaching-3.8%, economics-2.8%). Also, background features of the instructors were examined by the researchers such as gender(62.5% female, 37.5% male), age (12.5% between 41-45, 37.5% between 46-50, 25% between 51-55, 25% 56 and over), teaching experience (25% between 16-20, 37.5% between 21-25 and 37.5% between 26 and over), type of university (62.5% private, 37.5% state), departments (sports sciences-12.5%, psychology-12.5%, educational administration-37.5%, biomedical engineering-12.5%, English literature- 12.5%, mathematics-12.5%) and in-service training about online education before Pandemic (25% yes, 75% no).

Research Model
Researchers conducted a case study and mixed methods of design comprising both quantitative and qualitative parts in this study. Researchers prepared two surveys: survey 1 and survey 2.

Data Collection
Research data were collected between April 2020–August 2020 in the 2019-2020 Spring term.

Survey 1
For the quantitative part of the study, literature about online education before and during COVID-19 was examined. Based on the data obtained, survey 1 comprising three parts was prepared: The first part of survey 1 consists of the questions to find out the demographic features of the students. The second part of the survey consists of a pool of 43-items with 5-Likert type responses (1-*strongly agree*, 2-*agree*, 3-indecisive, 4-dis*agree*, 5-*strongly disagree*) to determine the perceptions of the students about the benefits of online education that they received during Pandemic.The third part of survey 1 comprises one semi-structured question: What are the obstacles faced by the students during online courses?. To ensure the content validity of the survey, the opinions of three field experts were received about the usefulness of the survey, directives, ordering numbering, and convenience of 5-Likert test questions and script format. Also, the survey form was checked by two Turkish language teachers in terms of clarity, conformity to grammar rules. Necessary changes were made in terms of the suggestions of the experts on the survey form. As a pilot study, researchers administered the survey form to randomly selected 15 university students to determine whether there are unclear items, sentences that need clarification, and sufficiency of the application period. After receiving the suggestions of the field experts and data obtained from the pilot study, the survey was finalized and sent to email and What's App groups of randomly selected university students who took an online education from various universities in North Cyprus during the pandemic. Responses of 500 university students (205 female, 295 male) studying at different departments were received back via the same method.

Survey 2
Survey2 comprises two parts. The first part of the survey comprises questions to determine the demographic features of the instructors. In the second part of the survey, there are semi-structured questions that the researchers ask to find out whether the teachers received training about online education, taught courses online before Pandemic; online platforms, and the type of online education that the instructors used during Pandemic. In the third part of the survey, there are semi-structured questions to take the evaluations of the instructors about their online teaching (an adaptation of curriculum and course content, online teaching platforms and strategies used, course evaluation, and obstacles they faced) during the pandemic and their further suggestions to improve and ensure the effectiveness of the online education. Two experts in the field and Two Turkish teachers checked the survey as in the quantitative part to ensure content validity. As a pilot study, researchers administered this survey to two instructors. After finalizing the survey in line with the suggestions of experts and pilot study, researchers sent this survey form to randomly selected instructors via e-mail, and the responses of 24 volunteer instructors were received by the same method.

Data Analysis
The quantitative data were analyzed by using SPSS 21 and AMOS 21. For the qualitative analysis; researchers used the coding reliability formula of Miles and Huberman (1994, p. 64): "P (% of Compromise) = [Na(Consensus)/Na(Consensus)+ Nd (Disagreement)] X 100" and reached .87 value. Coding and writing the themes lasted until the researchers agreed to eliminate the bias of the researchers and to ensure the internal validity of the themes. These themes and related coding are presented as a whole in the text. Descriptive analysis and content analysis techniques were used to analyze the qualitative research data. Answers of the students and

instructors to the questions were coded without assigning any names, as confidentiality dictates. Accordingly, students were coded as 'S', and each student was coded as 'S1, S2....'. Researchers coded the instructors as 'I', and each instructor was coded as 'I1, I2, I3, I4...'. The answer of each student and instructor was given in quotation marks followed by the code of the participant in parenthesis. An example of the coding system is given below:

Example-1: '.....' (S(1))

S: Student and 1, 2, 3....: number of the participant.

Example-2: '.....' (I(1))

I: Instructor and 1, 2, 3....: number of the participant.

Results

RQ1: What are the perceptions of students about the benefits of online education?

Students agreed with 30 of 43 benefits of online education stated in the literature (Table1). They disagreed with the 3 benefits of online education (Table 2) and they were indecisive about the 10 benefits of online education (Table 3).

Table 1 Benefits of online education that students agree with

Item number	Benefits	%
2	Enables large numbers of students to access information	93.2
6	Prevents loss of time to access information	84.8
21	Helps to get education from different universities	80.2
15	Increases student participation	76
8	Information is accessible when needed	73.2
16	Working is not a problem during learning	72.6
9	Information can be accessed without place limitation	63.6
11	Provides personalized learning	63.6
22	Allows students to get an education from different educators	63.4
38	Provides constructivist learning	61.2
20	Facilitates students with physical disabilities to access information	61.2
7	Information can be accessed without time limit	61
24	Reaching the subjects over and over helps to consolidate the subjects	60.2
19	A suitable learning environment for students with difficulties	59.4
17	The student can participate in a program that matches the speed of his/her learning	58
27	Enables students to socialize	57.8
18	It is a suitable learning environment for students with social phobia	57
25	Visuals help information storage in memory	56.6
28	Enables collaborative work	55.8
39	Allows individual learning	55
10	Provides access to information at a very low cost	52.6
26	Offers a rich educational environment to the student	49.8
3	Facilitates information sharing	48
37	Improves high-level thinking skills	47.6
35	Facilitates group work in the educational environment	46.2
23	An educator can transfer information to more students	44.6
12	The students can learn with the best learning method suitable for them	40.8
36	Provides effective learning	40.8
13	It is the most effective way of learning	40.4
1	Provides continuous learning compared to traditional teaching	36.4

Table 2 Benefits of online education that students disagree with

Item number	Benefits	%
42	Helps students become participant individuals in their future lives	50
34	Students in the educational environment develop positive attitudes towards each other	43.8
14	Improves learning performance	38.4

Table 3 Benefits of online education that students are indecisive about

Item number	Benefits	%
30	Allows creating original products	55.6
41	Helps students become active individuals in their learning lives	53.6
31	Enables use of new generation methods	51.2
40	Contributes to students being technology literate	49.2
29	Increases creativity	49
43	Increases students' desire for lessons	48.2
33	Creates a more participatory classroom environment	44.8
32	Creates a more active classroom environment	44.2
5	Online education is more qualified than traditional education	41.6
4	Allows equity in education	35.6

RQ2: What are the obstacles faced by the students?
Students emphasized 4 common obstacles that they faced during their online lectures (Table 4). The most common obstacle faced by the students was internet interruptions with a percentage of 60.4%.

Table 4 Obstacles faced by the students during online education

Obstacles	%
Internet interruptions	60.4
Difficulty to access online platforms with mobile phones	23
Not having a suitable room to study at home	56
Not having good knowledge about using online platforms	59.6

RQ3: Which online platforms did the instructors use during Pandemic?
Instructors stated that they used 8 different online platforms to teach their courses. Most of them usedMicrosoft teams and Zoom and also some instructors used more than one online platform (table 5).

Table 5 Online platforms used by the instructors

Online platforms	%
Microsoft teams	62.5
Zoom	37.5
Adobe Connect	25
Google hangout	25
Moodle	25
Google Classroom	12.5
Blackboard	12.5
Google meet	12.5

RQ4.Which type of online education did the instructors offer?
Instructors mostly used the Synchronous two-way interactive method (75%) and secondly, they used the Asynchronous two-way interactive (50%) to teach the course content (Table 6).

Table 6 Type of online education offered by the instructors

Type of Online education	%
Syncronous-One Way passive	12.5
Syncronous-Two Way interactive	75
ASyncronous-One Way passive	12.5
ASyncronous-Two Way interactive	50

RQ5:Which type of adaptations did the instructors make in course content and duration of the course?
Instructors stated that they did not make any adaption of the curriculum to online education. Instructors only removed the live practical parts (lab, internship...) from the course content. Instructors used animations to teach lab topics. Only the instructors from sports sciences reduced the course duration from 40 minutes to 30 minutes.

RQ6:Which strategies did the instructors use to motivate the students and increase student engagement?
Instructors emphasized that they used different strategies to motivate their students towards the course and increase their engagement in the course (Table 7). One instructor said that " *I used two-way feedback to gather information about the students' understandings and to assist them to advance their own learning and questioning. Also, most frequently I used questioning strategy to check students' understanding and to engage and challenge them. Especially, I tried to ask simple questions to the students. Students became very happy as they could easily answer the questions*" (I(8)).

Table 7 Strategies to motivate students and increase their engagement

Strategies	%
Two-way feedback	100
Video presentations	67
Question-answer	100
Problem-solving	33.3
Discussion	100
Collaborative learning	33.3
Make students listen to relaxing music	16.6
Warm greetings	100
Asking students about their problems (health,food, psychological..)	83.3
Asking questions to relate the topic to daily life	33.3
Asking simple questions so that students can answer easily and feel happy	33.3
Letting students ask questions	100
Giving students the chance to make powerpoint presentations about topics	50
Using more visuals to attract their attention	66.6

RQ7:How did the instructors evaluate the online learning of their students?
Instructors stated that they evaluated the online learning of their students by using 6 different tools (Table 8).

One instructor said that ' *I evaluated my students with online quizes, midterm, and final exams. In addition, I evaluated homeworks, projects and also presentations of my students to attract their attention to the lesson'* (I (19)).

Table 8 Evaluation of online learning of students

Evaluation tools	%
Online quiz	75
Take home homeworks	100
Projects	12.5
Student presentations	37.5
Essay writing	37.5
Midterm and final exams	100

RQ8:Which online resources did the instructors use?
Instructors stated that they used their own powerpoint presentations, videos, online books, and research articles also animations as resources to support their online teaching (Table 9). 100% of the participant instructors used their power point lecture notes, and also most of them displayed videos related to each topic. One instructor stated that "*All of my materials were ready as I have taught online courses before. I prepared all of my lecture notes as powerpoint presentations. I had my students watch the videos I found on YouTube on topics*" (I (2)).

Another instructor pointed out that "*I made powerpoint presentations in my lessons. I gave research assignments to my students. I sent them the links of online books and research articles especially free ones but unfortunately, we couldn't do laboratory experiments. I found laboratory animations prepared by many institutions such as Fisher on the internet and showed them to my students. There are few lab animations on the Internet, and unfortunately, you have to pay a high fee to access them*"(I(9)).

Table 9 Online resources used by the instructors

Online resources	%
Their powerpoint lecture notes	100
Videos on You Tube related to topics	50
Online books	75
Online research articles	37.5
Animations about lab topics	25

RQ9:What are the obstacles faced by the instructors?
Instructors mentioned about 7 different obstacles that they faced during online teaching (Table 10). 100% of the instructors mentioned internet interruptions, technological infacilities of the students, and problems of students accessing online platforms via their cell phones.

Table 10: Obstacles faced by the instructors.

Obstacles	%
Internet interruptions	100
Technological infacilities of students (not having a laptop, computer..)	100
Accessing problems of students via cell phones to online platforms	100
Apathy of students to online lessons	25
Insufficient knowledge of students about online education	100
Low student participation	25
Low student engagement	25

One instructor claimed that "*Many of my students lost their internet during my online classes. Since students did not have sufficient knowledge about online education before, they had problems while downloading their lecture notes from the system and uploading their homework to the system. Especially students who connected to online classes with their mobile phones had a lot of problems*" (I(14)).

Another instructor stated that "*When universities closed their campuses due to COVID 19, students returned to their homes. Some students left their computers, notebooks, and other personal belongings in their dormitory rooms because they thought they would return. Therefore, these students attended online classes with their mobile phones. I took attendance at the beginning of each lesson. Despite the high participation rate of students in my lessons, most of the students preferred to listen passively in class and did not actively take part in the classes*"(I21)).

RQ10: What are the suggestions of the instructors to increase the efficiency and quality of online education?
Instructors made suggestions for government, universities and all instructors to increase the efficiency and quality of online education (Table 11).

Table 11 Suggestions of the instructors

THEME 1:Suggestions for the government
Subthemes
Providing free internet to all students
Improvement in internet infrastructure
Computer and laptop custom reduction
Free COVID-19 tests for all teachers and students
THEME 2: Suggestions for universities
Subthemes
Adding technology course to the curriculum of all departments
Continuous in-service training to all teachers about online education
Offering hybrid education in future
Offering seminars to nurture psychological well-being to all students and staff
Salary increase due to over workload
Increase in group numbers and a decrease in student number in each group for each course
THEME 3: Suggestions for teachers

Subthemes
Working in collaboration
Regular online meetings to share experiences
Make more efforts to improve knowledge about effective online teaching
Paying more attention to students' problems
Using different online platforms
Using both Synchronous and Asynchronous online education

Discussion and Conclusion

The sudden outbreak of COVID-19 started in late 2019 in China, spread to all other countries at the global level. COVID-19 crisis has interrupted life with lots of loss of life, health impacts, and loss of livelihoods and affected education highly by impacting 87.6% of the world's total enrolled students. All the universities closed their campuses and shifted to online education. Although students accessed online education in digitally developed countries, unfortunately, students in most developing and under-developed countries couldn't. Afew recent research analyzed the challenges and also the opportunities of e-learning during Pandemic COVID-19. Evaluation of the quality of the online education delivered by the universities in each country is crucial to meet the needs and expectations of their students.

In this light, this study aimed to give new insights to the education management of the universities based on the online education experiences of students and instructors during Pandemic COVID-19. Researchers planned a mixed research design. 500 randomly selected students (41% female, 59% male; from different departments, most of them between the age of 21-30) and 24 instructors (62.5% female, 37.5% male; most between the age of 41-45, % 62.5 from state universities) from various departments of different universities participated in this research.

Students agreed 30 of 43 benefits of online education stated in the literature such as enables large numbers of students to access information, prevents loss of time to access information, helps to get education from different universities, increases student participation, information is accessible when needed, working is not a problem during learning, information can be accessed without place limitation, provides personalized learning, allows students to get education from different educators, provides constructivist learning, facilitates students with physical disabilities to access information, information can be accessed without time limit, accessing the subjects over and over helps to consolidate the subjects, a suitable learning environment for students with difficulties, student can participate in a program that matches his/her learning speed, enables students to socialize, it is a suitable learning environment for students with social phobia, visuals help information storage in memory, enables collaborative work, allows individual learning, and provides access to information at a very low cost. Many researchers advocated many potential benefits of online learning that the participant students agreed with in this study such as accessing at the most convenient time (Ruttenbur *et al*., 2000; Josep, 2020), cost-effective (Urdan and Weggen, 2000; Josep,2020), up-to-date (Asymetrix, 1997), quick (Cross, 2000; Hall, 2000), retainable (Asymetrix, 1997; Urdan and Weggen, 2000); risk-free (Urdan and Weggen, 2000), consisted (Snook,2000), interactive and collaborative (Urdan and Weggen, 2000), easy to track (Block and Dobell, 1999; Josep, 2020), empower IT skills (NEC, 2000),offers a wide selection of courses (Josep,2020).

Students disagreed with the items such as 'online education helps students become participant individuals in their future lives, students in the educational environment develop positive attitudes towards each other, and improve learning performance. This conclusion may be due to not experiencing online education before so they couldn't imagine that online education could help them to become participant individuals such as in many seminars, webinars, and conferences. They may believe that their learning performance is better in face-to-face learning and they couldn't find time to communicate with each other and develop positive attitudes.

Students emphasized 4 common obstacles that they faced during their online lectures. These obstacles in rank are internet interruptions, not having good knowledge about using online platforms, not having a suitable room to study at home, and difficulty accessing online platforms with mobile phones. Childs (2000) points out that technological limitations may cause frustrations and demotivation among learners during e-learning.

Most of the instructors used Microsoft teams and Zoom online platforms and used Synchronous-Two Way interactive and Asynchronous Two-way interactive method to teach. Instructors stated that they didn't adapt the curriculum to online teaching and only removed lab practicals from the course content and only the instructors from sports sciences reduced the duration of each course from 40 to 30 minutes. Bao (2020) suggests that faculty members need to divide the teaching content into several small modules and this supports our findings that instructors can adjust the duration of each small module as lasting approximately 20-25 minutes in order to ensure that students concentrate on online study.

Instructors emphasized that they used different teaching strategies to motivate their students towards the course and increase their engagement. These strategies are two-way feedback, video presentations, question-answer, problem-solving, discussion, and collaborative learning, make students listen to relaxing music, warm greetings, asking students about their problems, asking questions that relate the topic to daily life, asking simple questions so that students can answer easily and can feel happy, letting students ask questions, giving students chance to make powerpoint presentations, and using more visuals to attract their attention to the topics. As evaluation tools, instructors used online quizzes, take-home homeworks, projects, student presentations, and essay writings. Instructors stated that they used their own powerpoint presentations, videos, online books and research articles also animations as resources to support their online teaching. Bao(2020) supports the strategies used by the participant instructors and also suggests additional strategies for the instructors such as slowing down the speech to allow their students to capture key knowledge points of the course and modifying the homework and reading assignments to strengthen the active learning of the students outside of class. As the instructors experience online education more, they will explore many more resources to provide psychosocial support, digital learning management systems, systems built for use on basic mobile phones, massive Open Online Course (MOOC) Platforms, self-directed learning content, mobile reading applications, collaboration platforms that support live-video communication and tools for teachers to create digital learning content which are highly suggested by UNESCO (2020).

Instructors pointed out the obstacles that they faced during their online lectures as follows: internet interruptions, problems of students to download lecture notes, access online platforms and exams via cell phones, technological infacilities of students, apathy of students about online education, low student participation and engagement in courses. Similar obstacles and strategies to solve them were stressed by many authors in the literature (Collision et al.,2000; Hus et al.,2015; Quevillon,2020; Trammell and LaForge, 2017).

Suggestions of the instructors to increase the efficiency and quality of education can be classified into three categories: for government, for universities, and for instructors. Instructors suggested that the government can provide free internet to all students, improve internet infrastructure, reduce the custom of computers and laptops and test all teachers and students free for COVID-19 before face-to-face education starts. In addition, instructors pointed out that universities can add technology courses to curricula of all departments, give continuous training to teachers about online teaching, offer hybrid education, offer seminars to nurture the well-being of all students and staff, and increase group numbers with few students in each course, and finally increment in their salaries due to over workload. Last, instructors suggested that all instructors need to work collaboratively, have regular meetings to share their experiences, make more efforts to improve their knowledge about online teaching, pay more attention to problems of students, use different online platforms, and type of online teaching at the same time. Zhang et al. (2020) made similar types of suggestions for the government of China such as the use of high-quality broadband, speed up technology iteration, to equip teachers and students with electronic devices to meet the needs of online teaching and learning, providing systematic teacher training for use of online platforms for high-quality teaching, providing legal, financial and administrative support from government to the instructors for their professional development. We need more creativity as more countries close their schools to mitigate the problems in online education such as agreeing telecom companies to eliminate the cost of accessing online materials from the site of the Ministry of education and adaptation of existing online platforms for the use in smartphones (World Bank,2020).

This type of in-depth research can be carried out by all universities globally and the data will help all education leaders and management of the universities to determine the weak and strong points of their online education and re-manage and redesign their online education to meet the needs of students. Universities can produce solutions to mitigate their problems in online education and increase the quality of online education which can be accessed by all students. Also, based on the data instructors can adapt the curricula to online education, re-plan the duration of the lectures, the quantity of instruction, course content, and adapt teaching strategies, presentation techniques, teaching speed, style of assessment to online education, decide the best type of the online platform for their students and also plan their future education.

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H.Ş is the corresponding author. H.Ş designed the study, prepared the survey forms, conducted statistical

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Flexible Seating Impact on Classroom Environment

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ABSTRACT
As schools strive to instill college and career readiness within students, the academic success of students continues to be a priority of educators and administrators alike. The classroom learning environment utilized by students was examined throughout this study. Specifically, this study examined how the spaces within the classroom are utilized by students and how classroom spaces impact interactions between students and teachers. This qualitative study employed classroom maps and recording logs to gather data from students in second and fifth grade classrooms. With the data collected, the relationship between classroom environment and student engagement was examined. From the research, many common trends emerged. Common themes included that students prefer a specific seating choice in the classroom, flexible seating options were selected more than traditional seating options, and some students needed teacher directed instruction on modifications needed with seating choice or reminders how to sit in a specific choice. With these findings, it promoted a more collaborative work environment in the classroom.
KEYWORDS: Flexible Seating; Classroom Learning Environment; Traditional Seating, Elementary Education; Learning styles.

INTRODUCTION

The physical classroom design continues to change and move away from the traditional classroom set-up with the desks facing the front of the room. The traditional learning spaces in the classrooms consist of desks facing the front of the classroom with the teacher or podium located in the front (Sawers, Wicks, Mvududu, Seeley, & Copeland, 2016, p. 27). The classrooms are transitioning to a flexible-seating design in the classroom which allows more student choice and options for the students. The idea of using the flexible seating is mimicking the idea of a coffee shop or "Starbucks" for the students to work in around the room (Havig, 2017, p. 1). The classroom environment impacts the level of student engagement and academic success. The stakeholders of the field of education are looking at ways to continue to move in this direction for student success (Dotterer & Lowe, 2011, p. 1652). The students in the classroom need to be comfortable in the place they are learning which will lead to students being more engaged. The students will then be more attentive and will be more likely to participate in discussions that create a more meaningful, impactful learning experience (Reyes, Brackett, Rivers, White, & Salovey, 2012, p. 700).

Funding has been a big concern recently with policy makers beginning to distribute funds based on performance-based models. This shift has researchers dedicating more time and energy to "examine the factors that characterize ideal educational experiences" (Granito & Santana, 2016, p. 1). When utilizing performance-based models, student achievement is the ultimate focus. In order for students to be successful and achieve to the best of their ability, contributing factors that impact student achievement must be examined and analyzed. One contributing factor is that of student engagement which "is the amount of time and energy students expend on their studies. This has been linked to cognitive skills, college adjustment, and personal growth, all of which contribute to student success" (Granito & Santana, 2016 p. 1). The levels of engagement students experience in the classroom impact their success. As student engagement is linked to student attitudes and perceptions, the classroom environment in which they learn in is to be structured to meet their learning needs. Environmental conditions such as "temperature, color of walls, lighting, air quality, and acoustics can also impact student learning (Granito & Santana, 2016 p. 2). Taking a closer look at classroom environment allows educational stakeholders to determine manners in which to structure and create sound learning spaces to foster student achievement.

In today's classrooms, the teachers are continuing to make changes that will create the best learning environment for the students. Learning what that environment is benefits the students' achievement as well as the student-teacher relationship in the classroom. When looking into the best environment is for the students it is important to note the different factors that play into their success. Whether it is the design of the classroom, how the walls are decorated, the seating options, student choice or the technology used. The world is constantly changing and evolving, and the classrooms are no exception as they continue to move away from the traditional set-up. Being able to have a better understanding of how to create the best learning environment for the students will be beneficial in student success.

The purpose of this study was to determine which classroom workspaces students gravitate toward and the role of student choice in their selection. The study focused on the manner in which students utilize specific workspaces within the classroom and how student choice impacts the areas in which they choose to work. Furthermore, this study aimed to evaluate the use and practicality of the classroom environment and the designated spaces within it as they are utilized by students and teachers in relation to the level of student engagement that students experience in the space. School engagement is defined more clearly through understanding more about student behavior, thoughts, and feelings in relation to student classroom experiences (Dotterer & Lowe, 2011, p. 1651). The current trend in education has moved away from traditional, rigid classroom structure in order to create classroom environments that allow students the ability to work collaboratively. Twenty-first century classrooms include, "work tables and rolling chairs that can be arranged as needed for collaborative and team projects, teacher-led workshops, design workshops, and student presentations" (Adedokun, Burgess, Henke, & Parker, 2017, p.2). Considering the manner in which teachers can manipulate and structure the classroom environment in order to meet the needs of twenty-first century learners will encourage student success and achievement.

To facilitate a classroom environment specifically designed to meet the needs of all learners, educators must consider multiple factors including how "the social, instructional, and organizational climate of schools influences both students' engagement and their academic achievement" (Dotterer & Lowe, 2011, p.1650). In order to meet the various learning needs of all students, teachers must consider the physical environment because "while concentrating, students react differently to the immediate instructional environment--sound versus silence, brightness versus soft lighting, warm versus cool temperatures and formal versus informal seating" (Burke & Burke-Samide, 2004, p.238). Taking careful consideration of environmental factors will guide educators as they purposefully structure classrooms to facilitate enriching environments for learning to take place.

Identifying the factors that allow for student success in the classroom are very important. There are many factors that may play a role in this, and the classroom environment is essential. The design of the classroom is a physical manifestation of educational theories, philosophies, and values (Rands & Gansemer-Topf, 2017, p.27). Classroom designs with an emphasis on open seating concepts and open work areas allow for collaborative work. Students view their classroom as an open area where learning takes place rather than a rigid environment. Open workspaces and seating policies are affordances to students and teachers alike. Teachers have the ability to conference with groups of students more comfortably and naturally. Additionally, flexible classroom design encourages interaction and leads students to feel closer personal connections with their teacher and peers (Rands & Gansemer-Topf, 2017, p.29). Open workspaces also allow for active learning to take place. Active learning "has become an integral part of the student learning experience" because it provides opportunities for students to be at the center of their own learning (Rands & Gansemer-Topf, 2017, p. 26).

The important terms used throughout this study were defined as follows. Traditional learning spaces are defined as having the desks face the front of the classroom with either a teacher desk or podium located in the front of the room (Sawers, Wicks, Mvududu, Seeley, & Copeland, 2016, p. 27). Active learning classrooms are defined as a place that "uses movable work surfaces typically grouped in pods that do not usually face the front of the classroom; they are designed to create more access to technology as well as workspaces that allow for student interaction. They often include whiteboards that facilitate group problem-solving and peer-to-peer teaching" (Sawers, Wicks, Mvududu, Seeley, & Copeland, 2016, p. 27). Learning environment is an educational term used to describe the use of evolving technologies that are used for educational purposes and the constructivist concept for teaching and learning (Kuuskorpi & Gonzalez, 2011, p. 1). When referring to educational spaces, we are discussing areas in the classroom that allow for multiple learning and teaching styles to be applied as well as the use of new technologies (Kuuskorpi & Gonzalez, 2011, p. 1). A physical learning space more specifically is defined in the narrowest sense as "a conventional classroom and, in its widest sense, as a combination of formal and informal education systems where learning takes place both inside and outside of schools" (Kuuskorpi & Gonzalez, 2011, p. 2).

The significance of the study was directed toward practicing educators and administrators within the field of education. Both educators and students would benefit as a result of the study. The data gathered from the study would guide educators and administrators when making decisions regarding classroom design and its effects on student engagement. Students would benefit as a result of this study as they learn in classrooms designed for increased student engagement. The findings of the study would be valuable for various educational stakeholders especially when considering the movement toward implementing performance-based funding. Students learning in an environment specifically designed to be educationally stimulating have the ability to perform higher than those students who do not learn in such an environment. Having a deeper understanding of how classroom environment impacts student engagement, all stakeholders would be well prepared to make educational-related decisions in order to ensure students achieve academic success.

This study aimed to answer the following questions:

1. How are the defined spaces within the classroom utilized by students and teachers?
2. In the classroom, do the students continue to gravitate to a specific seating choice or area in the room to work?
3. Does flexibility with seating arrangements or student choice in where they work impact student engagement?

LITERATURE REVIEW

Common themes that have emerged through analysis and reflection of the topics associated with the classroom environment and student engagement include transformation, student learning styles, flexible seating, and emotional impacts. These components all share common threads that are intertwined making up the major themes throughout this review.

TRANSFORMATION

Classrooms today are undergoing many changes including being transformed from the traditional classroom design into spaces that better equip students for 21st century learning. The place in which we learn is very important because it plays a significant difference on the learning experience for students (Beard & Wilson, 2013, p. 93). The classroom environment varies based on the teacher, room arrangement, sounds, light, temperature, and decorations that are present within each space. With the classrooms undergoing these changes, many are moving away from the name of a classroom and towards the name of 'learning centers' (Beard & Wilson, 2013, p. 97). The switch of the classrooms is also a result of the implementation of the internet and more media options. The "dynamic teaching space" allows for the students to work in pairs, groups and have the ability to collaborate throughout the day (Kuuskorpi & Gonzalez, 2011, p. 5). Classrooms are not the only thing undergoing changes, but teachers' roles have changed drastically as well.

Today's classrooms are required to be more flexible for students and teachers to engage in learner-centered teaching practices. The availability of having classroom components that include moveable equipment such as worktables and rolling chairs provide opportunities for students to engage in more collaborative work requiring the students to take more responsibility for their own learning (Adedokun, Henke, Parker, & Burgess, 2017, p. 2). Technology, cultural, and social changes are continuing to alter the expectations of the classroom, or physical learning environment for teachers (Kuuskorpi & Gonzalez, 2011, p. 1). Teachers are not the only ones questioning the impact the school environment has on student engagement, but professional architects and educational planners are also continuing to research this area. More specifically architects and educational planners are looking at how the various designs have an impact on student outcomes with a focus on student behavior and achievement (Tanner, 2009, p. 382).

A shift in education has moved from viewing learning as a solitary process to a collaborative effort. To accommodate this change, chairs and seating styles are necessary tools within the classroom environment to improve learning engagement and attention (Harvey & Kenyon, 2013, p.3). Flexible seating and flexible learning spaces encourage movement within the classroom. Without this movement, brain activity is reduced when as body becomes inactive thus students become motionless and learning does not take place (Harvey & Kenyon, 2013, p.3). Flexibility within classrooms is of value in 21st century classrooms allowing for students to work in collaborative groups, a common practice in present day classrooms. Flexible learning spaces allow for altered seating arrangements to done inherently by the hands of the students as needed.

STUDENT LEANING STYLES

In the classrooms, teachers are expected to have a classroom that reflects each students' specific learning style (Burke & Burke-Samide, 2004, p. 238). Each student has a unique learning style, and the classroom should be able to accommodate students learning styles to promote student engagement. Today's classrooms are undergoing many

changes from previous years of the traditional classroom set-up because the traditional classroom design could have a negative effect on student growth (Burke & Burke-Samide, 2004, p. 237). It is noted that the use of rows of desks in the classroom that was traditionally used was to maximize the on-task behavior of students in the classroom (Adedokun, Henke, Parker, & Burgess, 2017, p. 2). We are now beginning to re-examine this classroom strategy because it does not align with our new beliefs of creating a learner-centered environment where collaborative work is part of the foundation of learning. The classroom environmental elements such as design, sound, light, and temperature all have an impact on students' achievement and their growth as well (Burke & Burke-Samide, 2004, p. 237). When students for example become distracted by the temperature in the classroom to an extent that it causes a level of discomfort, their lack of focus will inhibit their academic success.

Not only does the classroom need to be able to reach all students with their learning styles, but it also must provide a social place where students can engage in a positive social environment. There are many skills involved in creating this social classroom such as, the ability to solve problems, interact with peers working together, respect multiple perspectives and allow for students to interact with the tools in the classroom (Roskos and Neuman, 2018, p.113). The classrooms today have to be able to reach all students where they are and support them through their learning experience.

FLEXIBLE SEATING

There have been previous studies completed with similar findings "that the type of learning space can influence creative thinking, add excitement for both the student and instructor, and enhance teaching and learning experiences" (Sawers, Wicks, Mvududu, Seeley, & Copeland, 2016, p. 26). It is described that, "future learning spaces will provide greater flexibility and mobility of people, knowledge, furniture and other artefacts" (Beard & Wilson, 2013, p. 97). A new trend of using flexible seating in the classroom has become more popular and could decrease the amount of disruptive behavior occurring with students.

By using flexible seating in the classroom, the room begins to look more like a "Starbucks" with students working throughout the room, rather than at desks (Havig, 2017, p. 1). Some of the features that teachers are including in their classrooms to move away from the traditional classroom style include tables, pillows, couches, bean bag chairs, and therapy balls (Havig, 2017, p. 1). These flexible seating options are vital tools that can be the means to creating a more meaningful learning experience through environmental modes.

A fundamental design embedded within flexible seating is to link the design of the classroom to a purpose. At a basic level, flexible seating allows for multiple configurations of whole group, small group, and partners to talk, listen, read, write, play, and learn (Roskos and Neuman, 2018, p.111). The nature of flexible learning space and flexible seating is that they are fluid, not rigid. Flexible seating is implemented in mind with the overall goal that students select workspaces suited to their needs as a learning in order for them to be as successful as possible. Students are not limited to one specific seat or space; they make adjustments as they see fit. With the possibilities in the flexible seating options, it "can encourages positive behavior and prevent disruptive behavior" (Havig, 2017, p. 1).

It is important to realize that these pieces of furniture open a door to the opportunity for students to gain a greater sense of purpose and feeling of community within the walls of the classroom (Waldock, Rowlett, Cornock, Robinson, & Bartholomew, 2017, p. 588). Students are able to develop relationships with one another and the classroom instructors when provided the tools to create a partnership with one another. To further instill a sense of community within the classroom, desks should be positioned face-to-face so that not one student is alone or apart from any type of learning, a component which is crucial for all student success (Mott, Thomas, & Burnette, 2014, p.4). These opportunities for students to enhance and develop one another's learning through the connections that they can establish can be monumental to their educational experiences.

The study of flexible seating is constantly changing and evolving in the classroom as well as the impact on students is becoming more well known. The studies that do exist focus highly on the use of innovative pedagogy and the learning space that is required for implementing such practices. Many studies are also limited in knowledge due to the fact that student learning has been measured strictly through the use of student standardized test scores (Adedokun, Henke, Parker, & Burgess, 2017, p. 3). Many teachers and school districts are continuing to implement flexible seating options in their classrooms, but many do not have reasons for doing so other than thinking that it is a best practice supported by research. There is concern that many are implementing this without any published research to justify it and are just following along with the latest fad in education (Havig, 2017, p. 2). This lack of knowledge provides a gap in the information that we know about how the learning space can impact the learning process and student achievement.

METHODOLOGY

The proposed research study followed a qualitative design approach. Researchers obtained data based upon student seat selections utilizing the attached classroom maps and recording logs. After data collection, trends in the data were be analyzed and interpreted to draw conclusions about the second grade and fifth grade students at the research sites.

PARTICIPANTS

The participants in this study were elementary students who are second grade and fifth grade classroom. There were 25 students in the second-grade classroom and 40 students in the fifth-grade classroom. The two classrooms are located at an elementary school in central Illinois. The second-grade population includes 3 students with individualized education plans. The fifth-grade population includes 4 students with individualized education plans.

The students were be monitored based on where they are working throughout the day in the classroom. The students have a variety of seating options ranging from floor seating, ball chairs, standing, couch, stools, and chairs. The teachers will be monitoring the students based on the seating choices that they decide to work in and where they will be successful.

INSTRUMENTATION

Data was collected using a map of each classroom that outlined the various flexible seating options available for student use. After each student selected their seat of choice to work at, researchers noted their seating choices on the map. This process allowed researchers to record daily seating choices in order to analyze patterns and frequencies of choices. The seating map for the two classrooms are presented in figures 1 and 2.

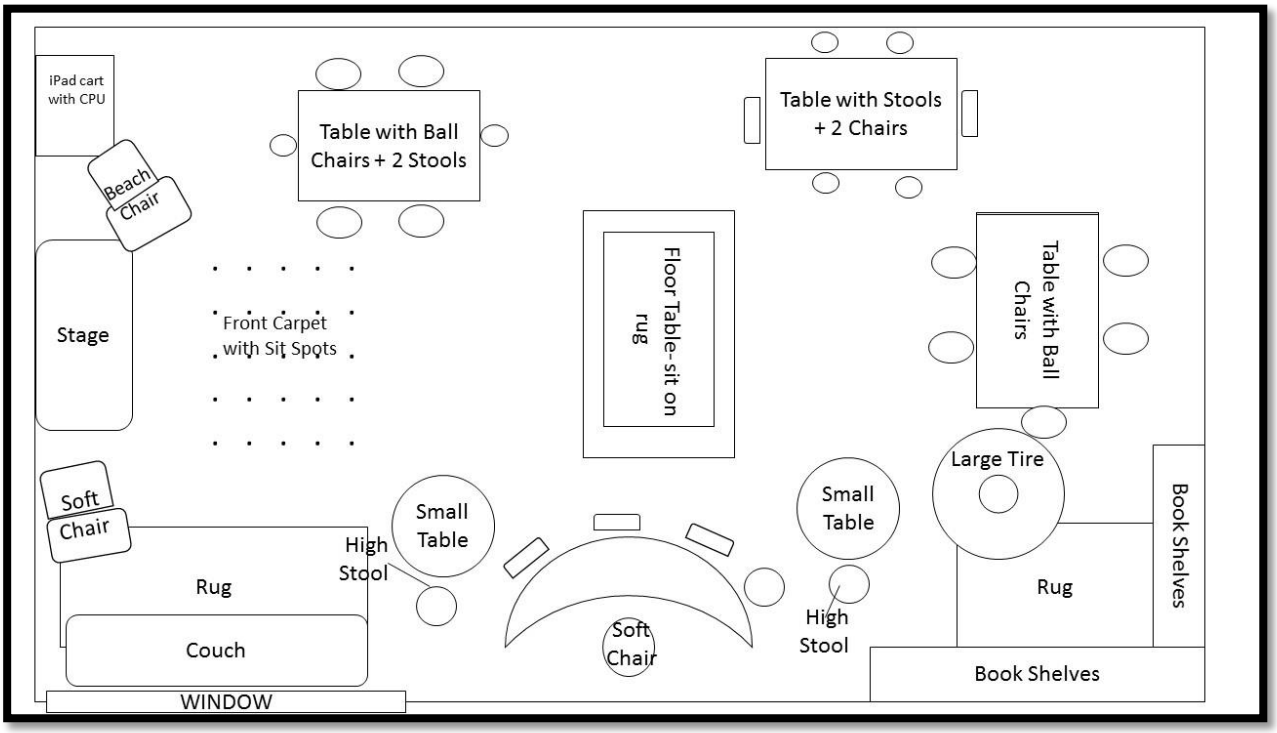

Figure 1. Seating Map for 2nd Grade Classroom

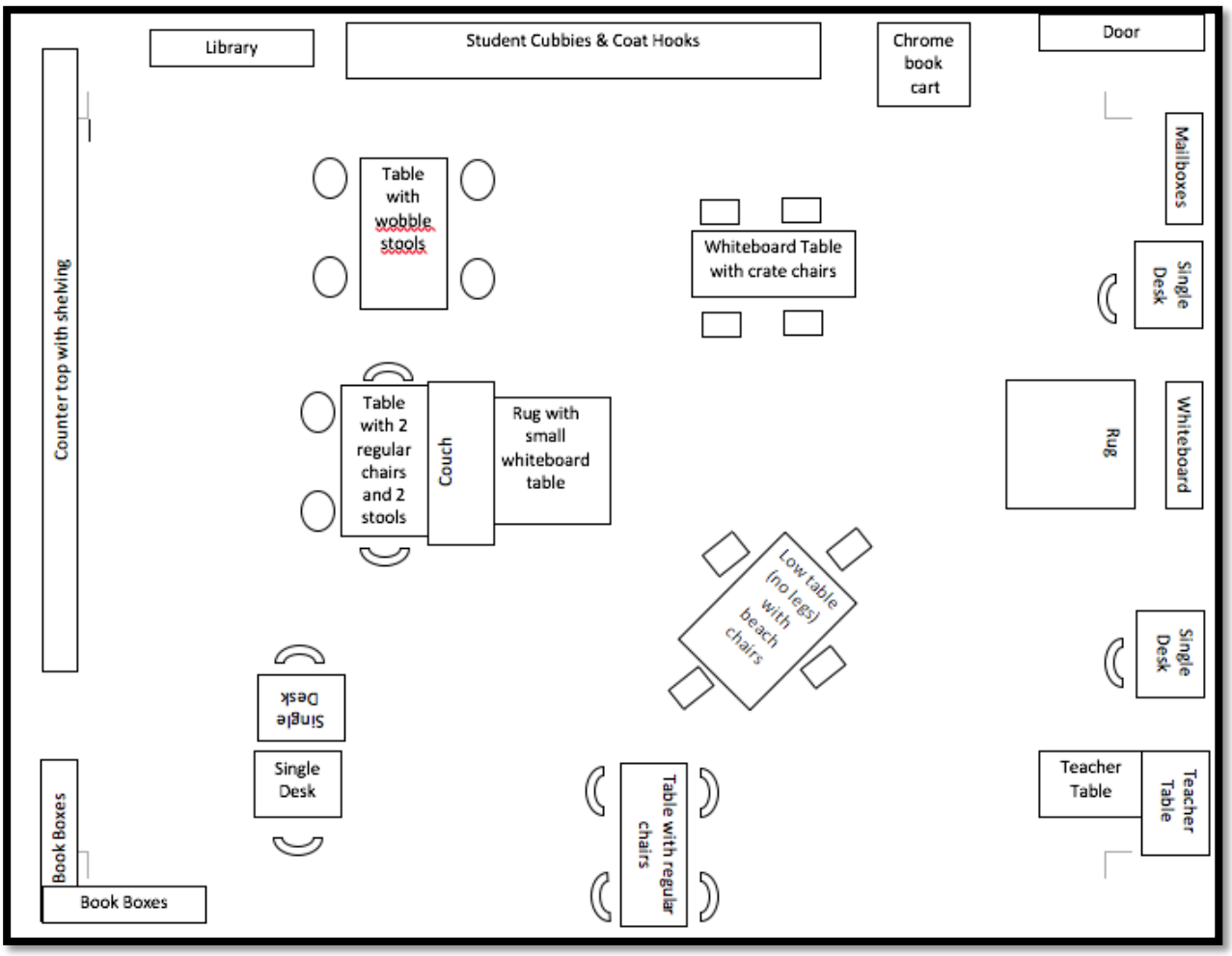

Figure 2. Seating Map for 5th Grade Classroom

DATA ANALYSIS PROCEDURES

The data that was collected via the classroom map and seating choice logs were organized and analyzed by the researchers. The researchers sought to identify patterns within the seating selections of the second and fifth graders. For example, were students choosing to sit with friends versus an area in which they can be the most productive? Did students select different seats each day or were their choices habitual? Were students choosing alternative seating or did they prefer standard chairs? Which students typically worked alone versus in a group? What was the most popular seating choice in the classroom? The information was documented on the seating choice logs for 2 weeks to determine what seats the students were picking to work at.

RESEARCH QUESTIONS

1. How are the defined spaces within the classroom utilized by students and teachers?
2. In the classroom, do the students continue to gravitate to a specific seating choice or area in the room to work?
3. Does flexibility with seating arrangements or student choice in where they work impact student engagement?

DEFINITIONS OF TERMS

The important terms used throughout this study are defined as follows. Traditional learning spaces are defined as having the desks face the front of the classroom with either a teacher desk or podium located in the front of the room (Sawers, Wicks, Mvududu, Seeley, & Copeland, 2016, p. 27). Active learning classrooms are defined as a place that "uses movable work surfaces typically grouped in pods that do not usually face the front of the classroom; they are designed to create more access to technology as well as workspaces that allow for student interaction. They often include whiteboards that facilitate group problem-solving and peer-to-peer teaching" (Sawers, Wicks, Mvududu, Seeley, & Copeland, 2016, p. 27). Learning environment is an educational term used to describe the use of evolving technologies that are used for educational purposes and the constructivist concept for teaching and learning (Kuuskorpi & Gonzalez, 2011, p. 1). When referring to educational spaces, we are

discussing areas in the classroom that allow for multiple learning and teaching styles to be applied as well as the use of new technologies (Kuuskorpi & Gonzalez, 2011, p. 1). A physical learning space more specifically is defined in the narrowest sense as "a conventional classroom and, in its widest sense, as a combination of formal and informal education systems where learning takes place both inside and outside of schools" (Kuuskorpi & Gonzalez, 2011, p. 2).

LIMITATIONS OF THE STUDY

A variety of limitations are evident within the study. First, student seating choices may be influenced by the day-to-day availability of the various seating choices. A system could be implemented within both classrooms in order to avoid this issue. For example, the researchers could create a schedule to specify a small group of students who can pick their seats first then change these groups daily. Another limitation within the study could arise if and when a student is not able to pick a seat where they would work the best. If a student needs a specific seat location due to behavior needs, their selections are then influenced by the teacher. Another limitation of the seating options is that some students may be distracted by others that sit near them. Since there is no assigned seat for students, who the students sit by can influence their engagement in an activity. If this leads to an issue with the students working on a task, the teacher may have to ask the students to find new seats or separate from each other.

DATA ANALYSIS AND INTERPRETATION

The purpose of this study was to evaluate the use and practicality of the classroom environment and the designated spaces within it as they were utilized by students and teachers in relation to the level of student engagement that students experience in the space. The participants of this study included 40 fifth grade students and 25 second grade students from an elementary school in central Illinois.

In considering the first research question posed, "how are the defined spaces within the classroom utilized by students and teachers?," it was noted that two specific areas were commonly underutilized by students in the fifth-grade classroom. Those two areas included the couch with the table in front of it and the table on the side of the room with regular chairs. All other spaces in the classroom were either full or had one open seat with each class that used the space. The whiteboard table with crates, the table with wobble stools, and the single desks were used most often by both fifth-grade classes. These findings indicate that they are the preferred workspaces for fifth grade students. Each day of the study, at least one student in each fifth-grade class was observed making a modification to their workspace whether it was a change of seat or it involved using a whiteboard or clipboard as a hard surface to write on rather than the table provided. All students who chose the crates with the whiteboard table used the table surface to compute math problems rather than their smaller whiteboards available to them in their book boxes. When looking deeper into the second-grade class, it was recognized that many students frequented many of the same seats multiple times and did not move from that seating choice often. During writing time, students cannot sit on the couch or tire because it is difficult for them to write at those seats, but at other times throughout the day, these were very frequented seats. The floor table and the ball chairs were often full each time as many students prefer these seating options. The small tables with the high stools were a seat that some students prefer, but if students needed a spot to focus better by changing their seating option they would go to this spot. When there were modifications that were done after a student started their work and often times this resulted in them getting a clipboard and sitting on the floor.

The second research question aims to determine if students gravitate toward specific seating choices or areas in the classroom. Figures 3 and 4 indicate that during the period of data collection, 7 of the 40 students never selected to use a regular chair at any point. These 7 students strongly favored alternative seating available within the classroom. Throughout the course of data collection, it was observed that the wobble stools, crates with the whiteboard table, and the single desks were always full or remained with one open seat. This finding indicates that these areas of the classroom were well received and utilized by students. In Figures 3 and 4, it can be noted that 16 of the 40 students preferred to utilize a workspace with a regular chair. As these chairs are spread out across a variety of workspaces, their selection in which space they used varied day-by-day. In the fifth-grade classroom, the practice that emerged was that students are using both traditional and flexible seating. It was observed that a handful of students habitually sat in the same area while a majority of the students changed up their seating amongst common areas of their choice. For example, in 5C, Chloe was found working at a single desk in the front of the room 8 out of the 10 days. It was also observed that select groups of students sat by each other habitually. In 5C, Abby H and Abby M were observed in the same workspace every day. In the second-grade classroom, many students had their few favorite spots that they normally worked in unless the tire or the couch were open. Most areas of the classroom were always being utilized and many students preferred the same type seating choice with a few variations. An example of this is Campbell, who sat 13/15 times at either the floor table or on the floor if the table was already full. Another example of the students gravitating towards a specific seating choice is Phoebe who sat in a ball chair 10/15 times. It is noted that the tire and couch did not have open seats, and the next seating

choice that students preferred was the ball chairs and the floor table. There are a few students who regularly chose to sit in a chair. But the majority of the time there were chairs left open and the ball chairs were full as well as the floor table. Figure 5 indicates that 7 students never sat in a chair during data collection and 9 students only sat in a chair one time. In Figure 5, it also shows that only 3 students never sat at a ball chair. This seating choice was picked the most by being selected as the seating choice 83 times.

F = Floor, C = Couch, Cr = Crates, S = Stools, WS = Wobble Stool, SD = Single Desk, BC = Beach Chairs, RC = Regular Chair *= changed seats later on due to choice/teacher X = absent

Braxton	RC	RC	RC	RC	RC	RC	RC	BC	BC	RC
Erin	WS	CR	CR	CR	X	CR	CR	CR	X	CR
Logan	CR	RC	RC	RC	BC	WS	BC	WS	WS	WS
Megan	RC	WS	WS	BC *	WS	WS	WS	WS	CR	X
Cam	RC	WS	WS	RC *	WS	RC	WS	C	RC	RC
Gabby	CR	CR	RC	RC	RC	RC	BC	WS	CR	WS
Rylie	S	RC	BC	BC *	CR	CR	CR	S	CR	WS
London	WS	X	CR	X	X	X	CR	CR	X	CR
Brynlee	X	WS	WS	CR	BC	RC	RC	RC	RC	BC
Desirae	WS	RC *	RC	RC	RC	S	S	BC	S	CR
Abby H	S	RC	S	S	RC	C	RC	RC	RC	RC
Darian	RC	CR	RC	RC	RC	BC	RC	C	RC	BC
Leah	RC	S	CR	S	WS	BC	ES	S	WS	C
Ethan	WS	CR	RC	RC	RC	RC	CR	CR	CR	RC
Cohen	CR	WS	WS	WS	BC	RC	C	WS	CR	S
Lilly	RC	RC	CR	CR	RC	RC	RC	RC	X	BC
Colton	X	BC	BC	BC	WS	WS	WS	BC	BC	WS
Abby M	S	RC	RC	X	RC	C	RC	RC	RC	RC
Chloe	RC	RC	RC	RC	RC	RC	RC	RC	S	RC
Olivia	BV	RC	RC	RC	S	S	S	BC	S	CR

Figure 3. Seating Choice Data for 5th Grade Students (Section 1)

Aycen	RC	RC	RC	RC	WS	C	CR	S	RC	RC
Jaiden	WS	CR	RC	BC	X	RC	WS	RC	ES	X
Addy	WS	CR	RC	RC	WS	RC	WS	RC	RC	WS
Paydyn	CR	CR	WS	WS	BC	S	CR	WS	BC	CR
Ava	RC	RC	CR	RC	BC	CR	RC	WS	CR	CR
Amy	CR	B	CR	CR	CR	CR	CR	CR	CR	CR
Kate	CR	WS	WS	WS	BC	RC	CR	CR	BC	CR
Robert	S	S	RC	CR *	CR	WS	BC	CR	CR	RC
Cole	BC	RC	CR	RC	CR	BC	WS	RC	CR	C
Hayden	RC	S	RC	RC	RC	RC	RC	RC	S	RC
Faith	X	WS	RC	RC	WS	RC	RC	RC	WS	RC
Matt	RC	WS	X	RC *	S	BC	RC	WS	RC	RC
Kendra	BC	RC	RC	RC	CR	BC	S	RC	RC	RC
Mikey	X	BC	BC	X	RC	RC	RC	BC	X	RC
Jensen	X	CR	WS	WS	RC	WS	WS	WS	WS	WS
Brody	RC	RC	CR	WS *	WS	CR	RC	RC	RC	RC
Izzy	BC	BC	BC	RC	RC	S	RC	BC	RC	RC
Grace	RC	RC	RC	BC	RC	BC	S	RC	RC	RC
Landen	X	BC	BC	CR	X	X	BC	BC	RC	BC
Reece	CR	WS	WS	BC	BC	CR	BC	BC	BC	BC

Figure 4. Seating Choices Data for 5th Grade Students (Section 2)

F= floor, C=couch, SC= soft chair, T= tire, S= stool, HS= high stool, BC= ball chair, Ch= chair, FT- floor table, - = absent

Allison	C	BC	BC	FT	F	T	BC	FT	BC	FT	F	FT	F	T	Ch
Ariana	-	F	FT	FT	BC	S	Ch	SC	SC	SC	SC	FT	SC	F	F
Brock	BC	-	FT	BC	FT	F	S	C	BC	F	Move out				
Camden	BC	BC	S	Ch	Ch	BC	BC	F	BC	S	BC	BC	S	S	FT
Campbell	SC	FT	F	FT	FT	F	FT	F	-	F	FT	F	FT	F	F
Caleb	C	C	HS	Ch	-	Ch	Ch	C	C	C	BC	BC	F	FT	Ch
Carin	-	-	FT	BC	Ch	BC	FT	FT	BC	-	-	FT	-	-	HS
Carter	BC	BC	BC	F	BC	T	BC	F	T	F	BC	BC	Ch	C	C
Casey	F	F	FT	S	FT	S	S	Ch	F	S	S	Ch	S	F	F
Conary	S	F	Ch	FT	S	BC	BC	BC	S	S	S	S	BC	BC	BC
Cole	Ch	F	Ch	S	Ch	S	Ch	BC	BC	S	BC	S	S	BC	HS
Cooper	F	SC	BC	HS	Ch	FT	FT	HS	C	Ch	Ch	Ch	BC	HS	F
Jacob	F	S	-	-	FT	F	Ch	FT	S	FT	FT	F	F	Ch	FT
Juliet	-	BC	HS	Ch	HS	BC	HS	F	F	BC	BC	F	Ch	Ch	Ch
Kameron	BC	BC	FT	HS	FT	F	BC	FT	BC	C	FT	T	F	HS	C
Kayleigh	T	T	BC	S	BC	F	BC	BC	HS	Ch	F	C	F	SC	F
Liberty	S	F	S	S	S	-	-	-	F	BC	F	F	FT	BC	S
Maeva	Ch	F	BC	S	S	S	FT	F	Ch	F	F	F	FT	BC	S
Max	-	-	BC	FT	HS	FT	F	F	F	F	Ch	F	C	F	FT
Noelle	FT	FT	FT	FT	BC	BC	FT	HS	HS	F	FT	BC	BC	FT	FT
Oliver	F	C	BC	BC	S	S	BC	BC	F	HS	BC	F	F	FT	Ch
Phoebe	-	C	BC	BC	BC	FT	BC	BC	BC	BC	BC	BC	BC	F	F
Savannah	S	S	Ch	BC	Ch	BC	BC	F	-	T	S	FT	FT	BC	T
Silas	F	F	F	BC	BC	BC	HS	F	F	S	HS	F	F	F	F
Trinity	-	-	F	S	BC	HS	C	T	C	Ch	HS	HS	F	C	SC

Figure 5. Seating Choices Data for 2nd Grade Students

The third research question asking, "does flexibility with seating arrangements or student choice in where they work impact student engagement?," yielded a few generalizations. First, some students needed to be moved and given specific areas to sit in as requested by the teacher. These students were moved due to disengagement during class specifically because they demonstrated off tasks behaviors, predominantly the inability to refrain from talking to their peers. After reminders and time away from distracting peers, this behavior was seen less frequently. Overall, when students were asked to take part in collaborative conversations at their groups, the conversations observed were on task and productive. It should be noted that all students in both fifth-grade classes and the second-grade class completed their work in a timely manner. Thus, their choice of seat did not negatively impact their ability to complete their work on time.

The major patterns observed as a result of the study indicate that students will utilize both alternative and traditional seating when both options are available. Another significant finding from the research indicates that students take it upon themselves to make changes in their workspace when necessary. This is as evidenced by them asking to move seats or by using a clipboard or whiteboard as a hard surface to work on rather than the table provided. One finding that should not be overlooked is the fact that even with alternative seating options, there will always be students that select a tradition workspace comprised of a regular chair at a desk and/or table.

The new understandings of this research demonstrate that students are able to self-select their seating choice in a second grade and fifth grade classroom. Students may select a variety of options at the introduction of flexible seating, but over time they will gravitate towards a specific seating choice where they can work best. An example of this is in second grade, there is a student who cannot focus on their work while sitting on a ball chair so when they decide on this choice, they either bounce too much, roll, and do not complete the work. This student made a choice that the seating choice of a ball chair was not a good option for them and decided to sit in other options.

The overall findings of the research resonate with the underlying themes of flexible seating. Flexible seating encourages students to select workspaces based upon their needs and that the selection is not permanent. Students will determine which workspaces best suit their needs and will make adjustments accordingly. Figures 3, 4 and 5 show that some students became creatures of habit regarding their seating choices while others ventured to choose a variety of options. During the period of research, no major behavior problems presented themselves with the fifth-grade classes. The few instances where students had to be assigned a seat lasted 2 days at most. Students selecting their workspaces did not hinder their ability to follow classroom expectations nor did it inhibit their ability to complete their classwork. In the second-grade class, two students lost ball chairs for the remainder of that day because they were using them inappropriately based on classroom rules, which resulted in them moving seats. The students then earned them back the next day and made a better choice. Student choice on where they sat in the classroom did not impact their class work and they still followed classroom expectations in the second-grade classroom.

Exceptions to the patterns observed throughout the course of this study emerge from the difficulty some students experience should they be unable to select a workspace that suits their needs. Those students that require teacher intervention in the workspace selection process will naturally take a longer time to determine their best space within the classroom to learn.

The information that we gathered supports the previous findings that is discussed in literature. Our students have had the opportunity to enjoy movement and options in the classroom. The students are able to make a choice based on their learning style about where they will work best as independent learners as well as collaborators in a small group. Both the second-grade classroom and the fifth-grade classroom has a relaxed feel and many different seating options for the students to decide to sit at. This is following with the coffee house feel of being a more relaxed setting. The results we found from our research agrees with the ideas in the literature about students being engaged and being able to self-select their seating choice.

As evidenced from the findings of the study, both the second and fifth grade students demonstrated ownership of their learning as they selected workspaces to suit their needs. The availability of having classroom components that include moveable equipment such as worktables and rolling chairs provide opportunities for students to engage in more collaborative work requiring the students to take more responsibility for their own learning (Adedokun, Henke, Parker, & Burgess, 2017, p. 2). Our students reflect this finding within prior studies because the students were constantly observed collaborating with their peers who shared similar interests in the chosen workspaces.

The flexible seating available to the second and fifth grade students predominantly chosen over the traditional seating options. Without this movement, brain activity is reduced when as body becomes inactive thus students become motionless and learning does not take place (Harvey & Kenyon, 2013, p.3). All flexible seating options in the second and fifth grade classrooms accommodate a student's physical movement. For example, the second-grade classroom uses ball chairs while the fifth-grade classroom uses wobble stools. The findings of the study indicate that these flexible seating choices were at capacity each day. The results of indicate that students prefer to be mobile while learning rather than inactive in a traditional chair.

As noted within the findings of the research, many students made modifications to their seating and were not limited to sitting in the same space each day. Students are not limited to one specific seat or space; they make adjustments as they see fit. With the possibilities in the flexible seating options, it "can encourages positive behavior and prevent disruptive behavior" (Havig, 2017, p. 1). The findings of our study support the notion of positive behavioral impacts and less disruptive behaviors because students were not restricted to teacher decided

workspaces. The implementation of flexible seating innately develops a student's sense of ownership of their learning as the navigate which classroom workspaces suit their learning needs. Little to no behavior issues arose in the second and fifth grade classrooms during the data collection process. Any issues were remedied after redirection, modeling, and conferencing.

The significance of the results of this study indicate that elementary school aged children are capable of selecting workspaces that best suit their learning needs. When presented with both traditional and flexible seating options, students will explore a variety of workspaces before establishing a habit as to their best working space. Additionally, the results indicate that students will make necessary modifications to their workspaces. If the seating option or surface does not meet a student's needs, they will take ownership and modify accordingly.

ACTION PLAN

Prior to carrying out our research, we had special interest in classroom environment. Specifically, we were interested in how to transform learning spaces within the confines of the traditional classroom structures evident within our schools. Many of the changes we had made in our classrooms prior to research were ideas we had gathered from colleagues and educators across the country within our personal learning networks. The prior seating and workspace changes were made with the idea in mind that students work best when they are in a supportive, flexible environment. Because of this understanding, we chose to explore flexible seating and classroom environment as it relates to student ownership and engagement.

The findings of this study further solidify that flexible learning environments are most conducive to student engagement, ownership, and achievement. Anytime a student is able to make choices as it relates to their learning, they are innately more engaged and assume ownership. Throughout the study, the students were encouraged to select workspaces that met their needs as a learner. Often, this process allowed students to try out a variety of workspaces in order to navigate which area of the classroom suit them best. Additionally, we learned which areas of our classroom are highly desirable amongst our students. Within the second and fifth grade classrooms, certain areas with flexible seating were deemed most popular amongst the students. Also, in both classrooms there were some students who never sat in a traditional seating option of chair and sat in the flexible seating options each time. This data collection made us more aware of which of our current workspaces should stay and which need to be redesigned.

Moving forward, we will continue to implement flexible seating within our classrooms and encourage our colleagues to do so as well. We will be advocates for classroom redesign to promote flexible learning spaces and move away from the traditional, rigid classroom structures. Because our results indicated which workspaces students find most conducive to learning, we will explore options to acquire more ball chairs, wobble stools, stools, lowered tables, etc. Though we had very few instances with misuse of workspaces and teacher intervention with seating selection, we will continue to model how to choose a workspace. This will require frequent review of expectations as well. As the concept of flexible learning spaces becomes a typical practice, the hope would be that students become accustomed to self-directed seating selection and it becomes a natural progression throughout their schooling.

As flexible seating and flexible learning environments coupled with student self-selection is somewhat a progressive practice. it will take time for teachers to break the mold of the traditional classroom structure. For many, this will require slow implementation with modifications made along the way. Another potential challenge is acquiring alternative seating and surfaces for students to work on. Historically, the process of acquiring such furniture is at the discretion of the teacher and the availability of school funds. While funding is limited, many teachers are able to write grants and have classroom items donated. There are many challenges with transitioning a classroom from a traditional design to a flexible learning environment.

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Instructors' Perspectives on Teaching Massive Open Online Courses

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Abstract
The massive open online courses (MOOCs) movement has gained its popularity during the COVID-19 Pandemic. The aim of this study is to explore the experiences of the instructors on teaching MOOCs during the pandemic. A case study design as one of the qualitative research approaches was used and content analysis was conducted to analyze the findings. Total 41 volunteer instructors have participated the study. In the present study, what the instructors think about MOOC practices, their motives for teaching, to what extent they could transfer the experiences they gained while teaching MOOCs to their regular courses during the pandemic, which materials and practices they have used more frequently, favorite features of their MOOCs, and what they suggest for the improvement of the MOOC portal they used were sought for. The analyses shown that the instructors found the MOOC quite useful, and they think that more resources should be allocated to improve and extent these courses. The primary motivations of the instructors to launch MOOCs were sharing their knowledge and experience, financial income, gaining experiences that will increase their effectiveness in face-to-face courses, and strengthening their professional visibility in the field. It was also emphasized that they used their experiences in MOOCs while they transfer to the emergency remote teaching during the pandemic. The instructors mostly used self-prepared online reading resources, self-recorded videos and self-prepared visuals. Instructors pointed out the gathering of learners with diverse characteristics, flexibility of time offered by the system and system's ease of use as their favorite features of the platform thorugh which they offered their MOOCs, Namely, AKADEMA of Anadolu University. Their suggestions for the improvement of AKADEMA portal concentrated on the need for better promotion of the portal, and provision of ETCS equivalence and certification.

1. Introduction

Open and distance learning is one of the practices that has emerged to meet the changing needs of individuals and societies as a result of the developments and changes in technology. Altering needs force traditional paradigms of education to transform, and lifelong learning emerges as a necessity. Massive Open Online Courses (MOOCs) are one of those practices that emerged to meet this need and are growing in popularity. MOOCs are virtual courses that are largely provided by universities, and volunteers can register and follow the content online. By taking learning outside the classroom environment, it has become a medium that is independent of time and place, learner-centered and that provides flexible learning opportunities for the learner. It is a medium that enables individuals to access up-to-date information they need for both their professional and personal development without any restrictions.

The concept of MOOC was coined by Dave Cormier to describe the course named "Connectivism and Connective Knowledge - CCK" given by George Siemens and Stephen Downes in 2008 (Yuan, & Powell, 2013). With the widespread use of MOOCs, different practices have emerged. Although these practices have common features in many ways, they differ from each other in terms of learning-teaching approaches they adopt. According to Siemens (2013), MOOCs have basically two different types: Connective (c)-MOOCs and Traditional (x)-MOOCs. Whereas the MOOCs designed with the connectivist approach are intended for the production and enhancement of knowledge using social networks, xMOOCs have an instructive philosophy and a structure that focuses mostly on the transfer of information and practice of the content. Besides, in recent years, hybrid Massive Open Online courses that use cMOOC and xMOOC models together, adopt the blended learning approach and appeal to a wider range of participants, have started to emerge (Siemens, 2013; Artsın, 2019; Sayın & Seferoğlu, 2015).

One of the most defining features of MOOCs is that they are grounded on the philosophy of openness. When considered as a continuum that starts with open universities, then extends to open access, open educational resources, and to massive open online courses respectively, openness refers to the learning scenarios in which the boundaries between learners and information resources are eliminated. Today, the principle of openness in education provides opportunities such as ubiquity of education and flexibility in terms of admission to and graduation from universities in addition to constituting the basis of open and distance learning (James & Bossu, 2014). The concept of openness in MOOCs has two primarily distinguishing features: MOOCS' being open to

learners outside the organizing institution without any prerequisites and using open educational sources (Sanchez-Gordon, & Luján-Mora, 2014). In other words, these features can be summarized as being open access and using open content. As for Niadu (2019) in addition to being open access and open source, MOOCs should also include open access to educational opportunities and the adoption of open learning strategies in learning and teaching.

Reviewing the definitions of openness in the literature, it is seen that while Walker (2005) emphasized its being accessible to everyone by virtue of affordablility, Wiley (2009) pointed out its being reusable, copiable, adaptable and editable. Openness was defined by Rumble (1997), too, as a concept in which limitations in the learning process are minimized and decisions for learning are made by the learner. When put together, the concept of openness in education can be defined as providing equal opportunities in education, and in line with this, being accessible to everyone free of charge or being affordable for every income group, being freely usable, distributable and continuous. When we examine the definitions, it is seen that each of them emphasizes different aspects of the learning process. With the changing needs, developing technological infrastructure and scientific developments, the concept of openness has brought about different ways of usage. Within this framework, it can be thought that the concept of openness is a notion that undertakes different missions in order to meet different needs in different periods of humanity.

Today, we are going through a period in which the whole world is affected by the Covid 19 pandemic. The crisis that the pandemic created in the world has affected all spheres of health, psychology, economy, and social life, and education has received a large share of this situation. As a precaution, education has been suspended in almost all countries. As a result of the effect of the global spread of the virus, open and distance education practices have emerged as the easiest and most feasible solution to ensure the sustainability of education. While distance education, which eliminates space and time limitations, is becoming a more preferred educational system with the development of technology, it turned out to be a compulsory option due to Covid 19. In this context, it can be thought that in addition to supporting formal education, open and distance learning practices will provide an important advantage by closing the education gap in different situations of crisis. In this regard, the overall purpose of this study is to examine the teaching experiences of the instructors who teach on AKADEMA during the pandemic. In the literature, it is seen that there are only a few studies which reflect the instructor thoughts on MOOCs. However, it is believed that without including instructors and their views on the process, no paradigm change in learning environments can be comprehended. From this perspective, in order to run AKADEMA courses more effectively, attractively and efficiently, plan for the future and develop policies, evaluation of the platform from the viewpoint of instructors is be made. It is believed that the data obtained will help to identify the problems and develop solutions in order to run MOOCs optimally. Moreover, it is assumed that the study will lead the way for other studies that will increase the effectiveness and efficiency of open and distance learning practices based on instructor opinions. Within the framework of this general purpose, answers to the following questions were sought for:

1. What is your general opinion on MOOC or OER (Open Education Resources) practices? Do you think that they can change the university education?
2. What are your reasons for teaching on AKADEMA?
3. Which learning materials and practices do you use more frequently in your courses?
4. To what extent has having taught on AKADEMA helped you in transferring your courses online during the COVID-19 Pandemic?
5. What features of AKADEMA courses do you like most? What would you suggest for improvement?

2. Method

In this study, case study design which is one of the qualitative research approaches is used. According to Creswell (2007), case study is an in-depth examination of a well-defined system based on large and comprehensive datasets. In the case study, a well-defined research subject is described and analyzed in detail in its real environment (Birinci, Kılıçer, Ünlüer & Kabakçı, 2009). With the obtained results, why the case has developed in that specific way and what should be focused on in future studies is revealed (Davey, 1991). Within this framework, in this study, AKADEMA platform is evaluated and analyzed in detail from the perspective of instructors. Based on the opinions of the instructors, it is believed that the present study will guide the studies that will increase the effectiveness and efficiency of MOOC practices. For this purpose, a content analysis was conducted on the responses received from instructors.

2.1. Data Collection and Analysis

An online questionnaire was prepared for the collection of research data and was shared with 80 instructors who taught on AKADEMA between November-December 2020. With this questionnaire, instructor opinions about MOOC practices, specifically about AKADEMA, were tried to be collected. 41 instructors who had taught on

AKADEMA, the MOOC platform of Anadolu University, participated in the study voluntarily. Instructors were asked to fill in the semi-structured web-based questionnaire. The opinions of field experts were consulted in order to check the extent to which the questionnaire serves the research purpose and its usability. Corrections were made based on the expert opinions. The research process and the procedures used in this process were explained in detail to increase the validity of the study. To this end, the research method, study group, data collection tools, data collection and analysis procedures and how the findings had been organized were explained in detail. The responses of participants were electronically recorded. Following the collection process, participant responses were transcribed, and content analysis was performed. The primary purpose of content analysis is to find concepts and relations that can explain the collected data. The fundamental process in content analysis is to collect similar data within the framework of specific concepts and themes, and then to edit and interpret them in a format that the readers can understand. (Yıldırım & Şimşek, 2013). In accordance with this, first, the data are conceptualized, then the themes that explain the data are identified by organizing the emerging concepts logically. For this purpose, the data were coded by the researcher and theme and sub-themes were created. In the coding phase, the researcher selected and coded the meaningful chunks of responses as words or sentences so that the themes in the responses could be inferred. In this way, the qualitative data obtained from the responses of the participants were summarized in plain language and themes related to each sub-problem were created. In order to ensure the reliability of the study, another expert on open and distance learning carried out the same process. Next, the codings of the two researchers were compared. At the end of the comparison, it was seen that although there were stylistic differences in the expressions used in the coding, there was no semantic difference, and the inter-coder reliability was high.

2.2. Study Group

One of the MOOC practices in Turkey is the learning platform named AKADEMA which serves as a massive open online course practice served by Anadolu University. Within the framework of this model which corresponds to the declaration of openness in the tradition of open education, courses which were intended for lifelong learning and prepared with the know-how and experience of Anadolu University have been made available to the masses on the Internet at http://akadema.anadolu.edu.tr without any prerequisites or cost. The aim of AKADEMA platform, which was initiated with the provision of seven courses in 2015, is to provide an environment and materials that would provide learning opportunities for everyone of all ages and backgrounds and to ensure that they have a structured learning experience that would support lifelong learning processes. As of 2020, it has been serving with a total of 120 courses under fourteen different categories. The courses within AKADEMA employ xMOOC practices that are characterized as "traditional" and adopt a behaviorist pedagogical approach. In other words, the open online courses on AKADEMA platform serve as courses which are free and open to anyone who wants to learn. AKADEMA courses, which serve as xMOOC practices, include short video lectures, other course materials prepared by instructors, discussion forums and assignments for assessment and evaluation.

3. Findings and Interpretation

The study examines the experiences of instructors who teach on AKADEMA during the pandemic in detail. Within the framework of this general purpose, answers to what the instructors think about MOOC practices, their reasons for teaching on this platform, which materials and practices they use more frequently, their thoughts on transferring their experiences to their formal education courses, their favorite features of AKADEMA courses and what they suggest for the improvement of these courses were sought for.

Table 1. Do you find AKADEMA and similar MOOC or OER practices meaningful and useful in general? Should our university allocate resources for such practices?

	Certainly Yes	Yes	I am not sure	No	Certainly No
In general, do you find AKADEMA and similar MOOC or OER practices meaningful and useful? Should our university allocate resources (human, financial, physical, time) for such practices?	25	15			

According to Table 1, all of the instructors have found the practices useful and responded “more resources should be allocated to similar practices” with “certainly yes” (f = 25) and “yes” (f = 15).

Table 2. Do you think MOOC or OER practices can change university education in general?

	Yes, it will change in a positive way	Yes, but I don't think there will be a positive change	I am not sure	I don't think it will change a lot	It will not have an effect

Do you think MOOC or OER practices can change university education in general?	24	2	11

When Table 2 is examined, it is seen that instructors think that MOOC or OER practices will impact university education positively (*f*=24). Besides, it is seen that the number of those who do not think that there will be a positive change is very low (*f*=2). It is seen that the number of those who responded "I am not sure" is quite high, too (*f*=11).

Table 3. Do you think that the certificates of completion obtained from AKADEMA courses should have a value (credit) in the students' regular degree programs?

	Yes, it should	Yes, but it should be similar to a certificate program	No, it shouldn't have, it should remain as personal development
Do you think that the certificates of completion obtained from AKADEMA courses should have a value (credit) in the students' regular degree programs?	18	11	10

According to Table 3, it is seen that the number of those who think that the certificate obtained from AKADEMA courses should have a certain credit is high (*f*=18). Yet, it is also seen that there are instructors who think that they should be certificate programs (*f*=11) and they should remain as personal development courses *(f*=10).

Table 4. What is your reason for teaching on AKADEMA?

To share my knowledge and experience as a faculty member	52
To earn financial income	16
To gain experiences that will increase the effectiveness of my face-to-face courses	12
To increase or enhance my professional visibility/image in the field	11
To reach student groups with diverse characteristics	10
To improve my online teaching competencies	9
To be interested in online course design and implementation	8
Upon the request of the managers	7
To start up different for-profit initiatives through online courses by using the experiences gained from AKADEMA	2
To learn the ways of producing educational materials on my own	1
To utilize the experiences on AKADEMA in other projects (research or practice) in my field	1

In Table 4, the reasons why instructors want to launch a course on AKADEMA are shown. As demonstrated in the table, instructors stated that they launched courses to share their knowledge and experience (*f*=52), earn financial income (*f*=16), gain experiences that would increase the effectiveness of their face-to-face lessons (*f*=12), increase and enhance their professional visibility / image in the field (*f*=11). Furthermore, they also stated that they launched courses to reach a diverse population of students (*f*=10), to improve their online course competencies (*f*=9), because they were interested in online course design and implementation (*f*=8), and upon the request of the managers (*f*=7). Very few instructors stated that they started courses in order to start up different for-profit initiatives through online courses by using the experiences gained from AKADEMA (*f*=2), learn the ways of producing educational materials (*f*=1), and utilize their experiences on AKADEMA in other projects (*f*=1).

Table 5. What is your reason to continue teaching on AKADEMA?

Enjoying interaction with a diverse population	71
Enjoying teaching online	26
To increase or enhance my professional visibility/image in the field	15
Enjoying sharing my knowledge and skills	15
To gain experiences that will increase the effectiveness of my face-to-face courses	8
To benefit from different teaching strategies and activities	8
To prepare and benefit from different educational materials	8
To improve my online teaching competencies	5

To start up different for-profit initiatives through online courses by using the experiences gained from AKADEMA	5
To utilize the experiences on AKADEMA in other projects (research or practice) in my field	2
Upon the request of the managers	1

Table 5 demonstrates the reasons for instructors to continue teaching on AKADEMA. When we examine the table, instructors expressed that they substantially enjoyed interacting with a diverse population (*f*=71), enjoyed online courses (*f*=26), wanted to strengthen their professional visibility / image in the field (*f*=15), and enjoyed sharing their knowledge and skills (*f*=15). It is seen that the same number of people (*f*=8) stated that they want to gain experience that will increase the effectiveness of their face-to-face lessons, try different teaching strategies and activities, prepare and try different educational materials. In addition, instructors emphasized that they wanted to improve their online teaching competencies (*f*=5), start-up different for-profit initiatives through online courses by using the experiences gained from AKADEMA (*f*=5). Besides, a small number of instructors indicated their willingness to utilize their experiences gained from AKADEMADA in other projects in their fields (*f*=2) and the request of the managers (*f*=1) as their reasons to continue teaching on AKADEMA.

Table 6. To what extent have you used the following learning materials in your courses?

To what extent have you used the following learning materials in your courses? Leave it blank, if you have not used it.	Very often	Often	Rarely	Never
Educational videos (Self-recorded)	22	3	2	5
Educational videos (Open education resources)	4	1	4	21
Educational videos (Work by someone else - no copyright issue)	3	4	7	15
Interactive videos (Self-recorded)	13	1	1	13
Interactive videos (Open education resource)	2		2	24
Interactive videos (Work by someone else - no copyright issue)	1	1	3	22
Online reading resources (My own lecture notes, excerpts from my works)	22	8	2	3
Online reading resources (Open education resource)	2	3	2	20
Online reading resources (Work by someone else - no copyright issue)	4	5	7	13
Must buy book (My own work)	2		2	24
Must buy book (Work by someone else)	1		2	22
Images (illustration, photo, chart, etc. – Self-prepared)	14	6	4	8
Images (illustration, photo, chart, etc. – Open education resource)	1	4	2	19
Images (illustration, photo, chart, etc. – Work by someone else - no copyright issue)	3	7	4	14
Animations (Self-prepared)	7	1		20
Animations (Open education resource)	2	2		24
Animations (Work by someone else - no copyright issue)	1	2	1	23
Simulations (Self-prepared)	5	1		20
Simulations (Open education resource)	5		1	20
Simulations (Work by someone else - no copyright issue)	1	1		24
Interactive e-learning materials (Self-recorded)	13	5	1	11
Interactive e-learning materials (Open education resource)	5	3		22
Interactive e-learning materials (Work by someone else - no copyright issue)	2	1	1	23

Table 6 displays how often the instructors use the learning materials. It is seen that the learning materials that instructors use "very often" and "often" are online reading resources (their own notes, excerpts from their works) (*f*=30), self-recorded educational videos (*f*=25), self-prepared visuals (illustration, photo, chart, etc.) (*f*=20) and self-prepared interactive e-learning materials (*f*=18). When we look at the responses "rarely" or "never" as a whole, it is seen that interactive videos (Open Education resource) (*f*=26), must buy books (their own works) (*f*=26), interactive videos (work by someone else - no copyright issue) (*f*=25) are the least used materials.

Table 7. How often do you do the following activities in your AKADEMA course(s)?

Table 7. How often do you do the following activities in your AKADEMA course(s)?	At least once almost everyday	At least once or twice a week	Once in two weeks	Rarely	Never
Posting an announcement	2	18	8	9	
Posting on the discussion board	8	10	7	8	2

Assigning homework and providing feedback to submissions	9	11	9	5	
Making quizzes or surveys	1	6	11	8	
Launching synchronous sessions (live lessons)		5	5	2	23

In Table 7, activities that instructors use most in their courses are shown. According to the table, it is seen that the most common activity of instructors is posting announcements almost every day at least once (*f*=2) and at least once or twice a week (*f*=18). It is followed by assigning homework and providing feedback to the submissions at least once almost every day (*f*=9) and at least once or twice a week (*f*=11). It is seen that posting on the discussion board is one of the most frequently used activities with a frequency of at least once almost every day (*f*=8) and at least once a week (*f*=18). It is remarkable that the least used activity is launching synchronous sessions (*f*=23).

Table 8. Which instruments / methods do you use in evaluating success in your course (s)? You may mark more than one.

Which instruments / methods do you use in evaluating the success in your course (s)? You may mark more than one.	
Completing learning activities	31
Doing homework	31
Final exam	11
Teacher opinion	1
Participation	3

In Table 8, assessment tools/methods used to evaluate learner success are demonstrated. When the table is examined, it is seen that instructors use completing learning activities (*f*=31), doing homework (*f*=31), final exam (*f*=11), participation (*f*=3), and teacher opinion (*f*=1) as the methods or instruments for evaluation.

Table 9. Has having taught on AKADEMA given you different ideas on conducting your face-to-face lessons? Are you inspired? Has it caused a change in your face-to-face lessons?

Has having taught on AKADEMA given you different ideas on conducting your face-to-face lessons? Are you inspired? Has it caused a change in your face-to-face lessons?	
Yes, it has given an idea, and I have changed my regular f2f courses at least slightly.	18
Yes, it has given an idea, but I could not apply it.	11
I cannot say that it has given much idea.	7
No, it hasn't given any idea.	4

When we examine Table 9, a big majority of the instructors (*f*=18) stated that having taught on AKADEMA gave an idea about conducting face-to-face lessons and caused a change in their face-to-face lessons. In addition, it is seen that some teachers have expressed their opinions as "It has given an idea, but I could not apply it" (*f*=11), "I cannot say that it has given much idea" (*f*=7) and "No, it hasn't given any idea" (*f*=4).

Table 10. Has having taught on AKADEMA given you different ideas on conducting your other online courses (courses in distance education non-thesis master's degree programs, etc.)? Are you inspired? Has it caused a change in your other online courses?

Has having taught on AKADEMA given you different ideas on conducting your other online courses (courses in distance education non-thesis master's degree programs, etc.)? Are you inspired? Has it caused a change in your other online courses?	
Yes, it has given an idea, and I have changed my online courses at least slightly.	25
Yes, it has given an idea, but I could not apply it.	9
I cannot say that it has given much idea.	5
No, it has not given any idea.	1

In Table 10, responses of the instructors regarding whether having taught on AKADEMA inspired instructors in conducting their other online courses (courses in distance education non-thesis master's degree programs, etc.) and whether it caused a change in their other online courses are presented. When the responses of the instructors are examined, it is seen that they have stated their ideas as "Yes, it has given an idea, and I have changed my online lessons at least slightly" (*f*=25), "Yes, it has given an idea, but I could not apply it" (*f*=9), "I cannot say that it has given much idea" (*f*=5), "No, it has not given any idea" (*f*=1).

Table 11. To what extent has having taught on AKADEMA helped you transfer your courses online during the COVID-19 Pandemic?

To what extent has having taught on AKADEMA helped you transfer your lessons online during the COVID-19 Pandemic?	
It has helped a lot	33
It has helped to a degree	2
I cannot say that it has helped much	4
It hasn't helped at all	6

Table 11 demonstrates to what extent instructors think having taught on AKADEMA helped them transfer their courses online during the COVID-19 Pandemic. According to the table, the instructors responded to this question "It has helped a lot" (*f*=33), "It hasn't helped at all" (*f*=6), "I cannot say that it has helped much" (*f*=4), "It has helped to a degree" (*f*=2).

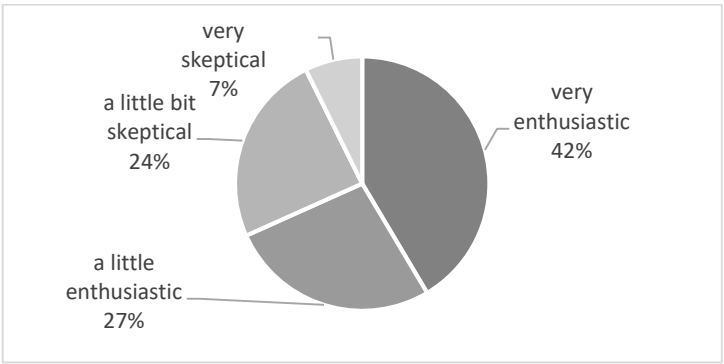

Figure 1: Feelings about the effectiveness of the courses conducted entirely online BEFORE teaching on AKADEMA

According to Figure 1, instructors stated that before teaching on AKADEMA, they had been very enthusiastic (*f*=17), a little enthusiastic (*f*=11), a little bit skeptical (*f*=10) and very skeptical (*f*=3) regarding the effectiveness of online courses.

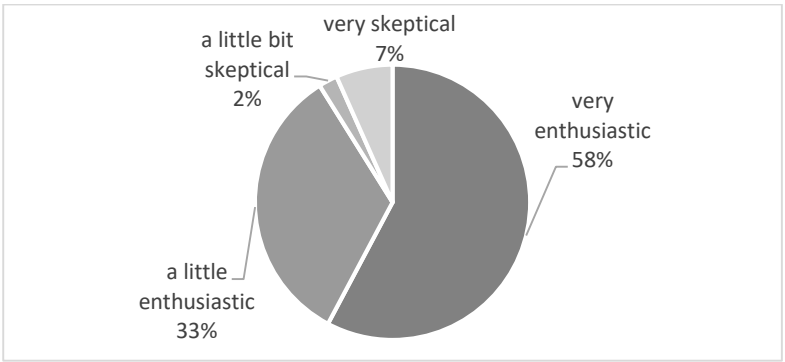

Figure 2: Feelings about the effectiveness of the courses conducted entirely online AFTER teaching on AKADEMA

As displayed in Figure 2, instructors expressed their current feelings about their fully online courses as "I was very enthusiastic" (*f*=26), "I was a little enthusiastic" (*f*=15), "I was a little bit skeptical" (*f*=3), "I was very skeptical" (*f*=1).

Table 12. What are your most favorite features and components of AKADEMA courses?

Gathering of learners with diverse characteristics	12
Time flexibility, enabling use at any time	6
System's ease of use, successful set-up with no possibility of making mistakes	5
Encouraging participation with discussion forums	4
Providing social service	3
Being free of charge	3
Subject diversity	3

Presence of synchronous sessions	2
Being able to plan the courses as I want	1
Promoting self-learning	1
Demonstrating how courses in various disciplines can be taught at a distance	1
Ensuring the formation of learning community	1
Being able to make quick assessments	1

In Table 12, instructors' favorite features and components of AKADEMA lessons can be seen. When the table is examined, it is seen that a large majority of the lecturers (*f*=12) highlighted the gathering of learners with diverse characteristics as a reason. Following that, "Time flexibility, enabling use at any time" (*f*=6), "System's ease of use, successful set-up with no possibility of making mistakes" (*f*=5), "Encouraging participation with discussion forums" (*f*=4) were the responses respectively. In addition, other responses were expressed as; "Providing social service" (*f*=3), "Being free of charge" (*f*=3), "Subject diversity" (*f*=3), "Presence of synchronous sessions" (*f*=2). A small number of instructors (*f*=1) stated that "Being able to plan the courses as I want", "Promoting self-learning", "Demonstrating how courses in various disciplines can be taught at a distance", "Ensuring the formation of learning community, and "Being able to make quick assessments" were the aspects they enjoyed.

Table 13. What should be done to improve AKADEMA platform and courses?

Promotion should be done better; more participants should be targeted	15
ETCS equivalence should be provided, certification should be issued	12
Instructors should be motivated by the institution	5
The exam system should be improved	3
The number of synchronous sessions should be increased	2
Technical support should be provided for the transfer and transformation of the lessons	2
Video-supported training should be provided on the production of lessons	2
Course participants and instructors should be interviewed to improve the system	1
Contents should be prepared more interactively	1
Number of course weeks should be increased	1
The interface should be designed more effectively	1

In table 13, the suggestions of instructors for the improvement of the courses on AKADEMA platform are presented. When we examine the answers, it is seen that most of the instructors (*f*=15) think that this platform should be better promoted, ETCS equivalence should be provided, and a certificate should be issued (*f*=12). In addition, it is stated that instructors should be motivated by the institution (*f*=5), the exam system should be improved (*f*=3), the synchronous lesson hours should be increased (*f*=2), technical support should be provided for the transfer and transformation of the lessons (*f*=2), video-supported training on the production of lessons should be provided (*f*=2), and course participants and instructors should be interviewed to improve the system (*f*=1). Some of the instructors suggested that contents should be prepared more interactively (*f*=1), the number of course weeks should be increased (*f*=1), and the interface should be designed more effectively (*f*=1).

4. Conclusion and Suggestions

According to the research, all of the instructors stated that the practices made on AKADEMA are meaningful and useful. Furthermore, it is emphasized that these practices will affect university education positively, therefore resources should be allocated for such practices. According to the results of the research, it is seen that the primary motivations of the instructors to start courses on the AKADEMA platform are to share their knowledge and experience, to earn financial income, to gain experiences that will increase their effectiveness in face-to-face lessons and to strengthen their professional image in the field. Likewise, in the studies in the literature, it is seen that instructors are motivated by gaining experience from using new technologies when teaching online, applying new teaching techniques and methods (Green, Alejandro & Brown, 2009; Hiltz, Kim & Shea, 2006) and by the financial support provided by the institution (Gannon-Cook & Ley, 2004; Moore & Anderson, 2003). In similar studies, instructors stated that using new teaching methods and techniques in open and distance learning practices, integrating new technologies into learning processes and the experience they gained in this way motivated them (Green, Alejandro & Brown, 2009; Hiltz, Kim & Shea, 2006; Schnitzer & Crosby, 2003). Correspondingly, parallel to the results of the research, Menchaca and Bekele (2008), too, mentioned that open and distance learning practices strengthen the image and increase the visibility of institutions. There are also some studies which show that the leading factor in motivating instructors is the financial support by the institutions to those who are involved in online practices (Gannon-Cook & Ley, 2004; Moore & Anderson, 2003). At this point, it is seen that the results of the research are in parallel with similar studies in the literature.

Reasons for why the instructors continue teaching on AKADEMA have also been questioned in the study. When we examine the results, the motivation for the instructors to start teaching on AKADEMA are expressed as gaining experience, strengthening their professional image and earning financial income. On the other hand, majority of the instructors have stated that their reasons for continuing to teach on AKADEMA are communicating with diverse populations and enjoying the online course environment. In this context, it can be said that the more experiences instructors gain in teaching in online environments, the more positive their attitudes towards the environment become. Studies in the literature have also concluded that there is a negative relationship between online teaching experience and resistance to the environment (Alshangeeti, Alsaghier & Nguyen, 2012; Lloyd, Byrne & McCoy, 2012; Manderbach et. al., 2012). It is noteworthy that the investments made by educational institutions in technological infrastructure have escalated recently, and accordingly, improvements in technology knowledge and skills of instructors have been observed. At this point, it can be said that the positive developments discussed above can expand from learning processes to the whole system via digital tools. Thus, it can be argued that open and distance learning practices can both support the education system during the period we have been experiencing due to Covid 19 and make it possible to increase the quality of higher education.

As another result of the study, it is seen that the learning materials that are most frequently used by the instructors are self-prepared online reading resources, self-recorded videos and self-created images. In similar studies in the literature, it is seen that instructors prefer video lectures and educational videos in their learning processes, too (Basilaia & Kvavadze, 2020; Burke & Dempsey, 2020; Mulenga & Marban, 2020; Roy, 2020). In the previous studies, it was emphasized that online learning activities are mostly teacher-centered (Özdaş, 2018; Akpınar & Gezer, 2010). In their study with learners, Karatepe et al. (2020) found that online lecture by instructors is the most useful method of instruction. In the study conducted by Valiente et al. (2020), it is seen that the top four most effective resources used in open and distance learning practices are oral presentations, videos, content and assessments. In the study conducted by Karadağ and Yücel (2020) in Turkey during the Covid 19 period, it is purported that the use of poor-quality materials which are not prepared by the instructors themselves and have little relation with the content of the course is a major source of problems. Analogous studies demonstrate that using content that is not self-prepared by instructors and presenting irrelevant content are among the factors that decrease the quality of online learning (Zhou, Li, Wu, and Zhou, 2020). In a nutshell, it is seen that instructors prefer using traditional teaching methods that they are accustomed to. Their belief that using self-prepared content would cause no copyright issues can be regarded as another reason for this. In this context, it can be said that instructors prefer using self-created materials, and the results of the study are parallel with the results of similar studies in the literature.

According to the results of the study, the activities most frequently employed by instructors on AKADEMA platform are posting announcements, assigning homework and providing feedback. In the evaluation process, doing homework and completing learning activities are prioritized. In the announcements section of the platform, all kinds of notifications about the learning process are made. In the studies conducted in the literature, the importance of the effective use of the announcement system is also mentioned, and it is emphasized that by using the announcements effectively in the online environment, it will be possible to attract the attention and sustain the motivation of learners (Kışla et al, 2014; Lim et. al, 2014).

Besides, many universities conducting open and distance education practices in Turkey consider assignments as a part of the learning process. In addition, universities that implement open and distance learning practices also use assignments as a means of evaluating students (Mutlu, Öztürk & Çetinöz, 2017). Likewise, Karatepe et al. (2020) point out that in systems based on open and distance learning, instructors mostly perform the evaluation process based on the feedback they give via assignments. Furthermore, an overview of other practices in the world reveals that assignments are one of the most widely used activities in online learning environments. The Open University of Britain, too, uses assignments for both formative and summative assessments (Hew, 2016; Baran, 2020). Also, Emine's (2015) study has revealed that weekly assignments would be a suitable method to sustain participation in distance education courses. The previous research emphasizes that instructor feedback in MOOCs increases the participation of learners in the courses and helps them focus their attention on the subject they are studying (Dong & Goh, 2015). As a result, student learning is reinforced by assignments and assessments thereby affecting student performance and learning motivation positively (Ok & Çalışkan, 2019; Buzzetto-Moreve Alade, 2006; Lynch, Goold & Blain, 2004). For this reason, assignments and activities should ensure new learnings and the use of skills, and they should be used as a means to make sense of prior learnings.

According to the results of the research, the instructors highlighted that having taught on AKADEMA has inspired them about conducting their face-to-face lessons and caused a change in the courses they have delivered both face-to-face and online. In addition, almost all of the participants think that having taught on AKADEMA helped them a lot to transfer their courses online during the COVID-19 Pandemic. For open and distance learning practices to

be successful, it is vital that instructors know how to integrate technology into learning processes and develop appropriate competencies (Berigel and Çetin, 2018). Cadlof (2020), too, mentioned that gaining experience from online learning practices is an important component for the effective execution of the process. In the study conducted by Ulmer et al. (2007), it is stated that in the courses delivered by instructors with online teaching experience, student performance and teacher-learner interactions are as effective as that of face-to-face education. Successful implementation of open and distance learning practices is highly influenced by attitudes and approaches of instructors towards these environments (Bakioğlu & Çevik, 2020). In this context, it is seen that the experiences that instructors gained on AKADEMA benefited them especially in managing their courses in formal education during the pandemic. Based on these findings, it can be said that the experiences of the instructors on AKADEMA both impacted their attitudes positively and made it easier for them to use the skills they gained from using technology in other courses. At this point, it can be claimed that having taught on AKADEMA during the pandemic provided an opportunity for instructors to improve themselves and helped them to feel self-confident.

The results of the study revealed that the favorite features of AKADEMA emphasized by the instructors are the gathering of learners with diverse characteristics, time flexibility offered by the system and system's ease of use. One of the most important features of MOOCs, which are open and distance learning practices, is that they can gather learners with highly diverse characteristics. They allow people from different countries, cultures, age groups and areas of interests to study together and meet in a discussion platform regardless of time and space constraints (Demirci, 2014). Previous research demonstrates that ease of access is one of the important advantages of open and distance learning practices (Gök, 2015). This reveals that being independent of time and space is one of the reasons for choosing distance education (Kılıç & Seyis, 2014). It can be thought that the target audience of MOOC platforms is people who would like to attend universities but somehow cannot; and this perspective would pave the way to the democratization of education. Within this frame of reference, it can be said that the philosophy of openness which facilitates the democratization and liberation of information and learning is the common ground of MOOC systems. MOOCs offer equality of opportunity in education by allowing participants to have ubiquitous access to education. It can be denoted that, that MOOCs disregard the regions participants live in, their ages, levels of income, ideologies and levels of education in providing these services is one of their characteristics that reflects the philosophy of openness (Peter & Deimann, 2013). It can be asserted that openness is one of the concepts that distinguishes MOOCs from smaller-scale online learning environments, and that their most fundamental components are open access and open content. MOOCs are also open to learners outside the organizing institution without any prerequisites and they offer open educational resources to all participants. In this context, it can be said that most favorite feature of AKADEMA for instructors is the system's philosophy of openness and the reflections of this philosophy in practice.

Additionally, instructors emphasized that AKADEMA platform is user-friendly. The user engages with the online learning system through its interface. For this reason, it can be argued that user-friendly interface design is one of the major determinants of the impact that the system will create (Bozkaya & Bozkurt, 2013). If one cannot use the features offered by the system, the features provided by the open and distance learning platform remain obsolete. It can be assumed that basic interventions such as logical division of the sections in the online learning system and designing graphic elements in a way that makes the system easier to use can ensure smooth adaptation of the users to the system because it can be said that the difficulties or ease of use encountered in the system while using MOOCs will affect participants' attitudes towards using the system.

The suggestions of instructors for the development of AKADEMA platform center upon the need for better promotion of the platform, the provision of ETCS equivalence and certification. According to the research, instructors think that AKADEMA platform should be promoted more effectively. Similarly, in their research that aims to identify the reasons for dropouts in AKADEMA, Aydın and Yazıcı (2019) state that AKADEMA should be promoted more. According to the previous studies, new technologies are used by educational institutions in learning processes to reduce costs, increase the quality of education and even ensure the visibility of universities (Bolliger & Wasilik, 2009; Menchaca & Bekele, 2008). As the number of participants who join MOOCs increases globally every day, it is obvious that its significance will increase in Turkey, too (Ergüney, 2015). Based on this foresight, it can be postulated that in order to achieve success in this field, it is crucial for educational institutions to develop policies regarding MOOC practices. One of the important steps of these policies is the effective promotion of practices. To this end, social media profiles of the university can be used to promote AKADEMA platform; Facebook, Twitter, YouTube and Instagram can be considered as effective MOOC marketing channels.

Another strongly highlighted suggestion for the development of the AKADEMA platform by the instructors is that the courses should be accredited and certified. Previous research show that one of the most important reasons for enrolling in MOOCs is the desire to receive a certificate at the end of the course (Young, 2013). In line with this, the studies in the literature indicate that the chance to receive a certificate of participation may reduce dropout rates

(Waard, 2011; Zhou, 2016). In this respect, it can be anticipated that establishing the conditions for granting certificates to those who have completed AKADEMA courses will make these courses more attractive. Certifications and diplomas should be expanded and regulations regarding the validity of these documents should be made. Higher education institutions should develop a clear stance on this issue and be able to offer learners global opportunities for lifelong learning. Some of the available programs are incentive as they make it possible to be verified with a certificate or diploma. MOOC programs which are open to all students free of charge are also used for important teaching outcomes such as certificates and indicators of professional competence that are valid in many universities. Therefore, it is necessary to develop an international quality system in order to increase the reliability of these programs. The studies in literature highlight the increasing necessity for the quality and evaluation mechanisms of rapidly developing MOOCs (Wang et al., 2013). As an initial step, some criteria can be set to measure the quality of the courses in order to credit or certify MOOC courses. Certain standards on how the courses to be included in the MOOC platform should be designed, how their contents should be structured, and how learning materials should be designed to ensure interaction can be established. Thus, the way for the process of crediting and certification of courses can be paved.

In conclusion, the primary purpose of this research is to investigate the teaching experiences of instructors who teach on AKADEMA during the pandemic. At times, crisis periods accelerate change which thereby accelerates the development process. This period necessitated the instructors who teach on AKADEMA to adopt roles such as using technology, sharing information via technology, preparing course content and materials, and employing various teaching methods. In this respect, it can be said that instructors have kept up with the changes that they have experienced. The results of the study demonstrate that instructors have positive attitudes towards their teaching experience on AKADEMA. This also substantiates that instructors are open to innovations in using new technologies, and they could turn the process into an opportunity by transferring their experiences they gained through AKADEMA during the pandemic to their formal courses.

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Mathematics Teachers' Opinions on Distance Education Using the Educational Informatics Network (EBA)

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ABSTRACT
The aim of this study is to put forth the opinions of mathematics teachers about distance education carried out using the Educational Informatics Network known as EBA (Egitim Bilisim Agi) which is a new practice in Turkey. In accordance with this objective, 10 Mathematics teachers who work in institutions affiliated to Ministry of National Education in Giresun Province form the sample group of the study. The data were collected using a semi-structured interview technique consisting of eight open-ended questions developed by the researcher in this study where the special case method was used. Themes were created based on the data and the frequencies of the themes were determined and presented in tables. In line with the data obtained, it is seen that distance education using EBA prevents students from losing their ties with the school while they stay at home and provides them the experience that education can continue under all circumstances. That being said, students who did not have internet or computer at home were not able to benefit from the education since they could not attend the classes. Additionally, since the live courses held in EBA are not being recorded, students cannot find the opportunity to watch the lessons later on if they cannot attend them. For these reasons, it is suggested that live courses be recorded and made accessible to students and every student should be provided with free internet service in order to ensure equal opportunities in education.
Keywords: Educational Informatics Network (EBA), Teachers' opinions, Distance education

INTRODUCTION
Technology is being increasingly involved in all of the areas of our lives in the current century and has a significant role in the field of training and education as well. Many innovations have also been implemented in Turkey in order to keep up with the developments in the world and to integrate technology and education. One of these innovations is the Educational Informatics Network (EBA) platform, which was introduced into education by the project called "Movement of Enhancing Opportunities and Improving Technology" (FATIH). Educational Informatics Network (EBA) is an online social education platform provided free of charge for the use of people by the Directorate General of Innovations and Education Technologies (Educational Informatics Network, 2016; as cited in Ozen, 2019). The EIN platform, which was started to be used in 2011 consists of different applications such as videos, books, presentations, activities and contents. By using this platform, teachers have the opportunity to create and share their own teaching materials, and students have the opportunity to repeat subjects, study the lessons they missed, and carry out activities (Alabay, 2015).

It is the responsibility of democratic societies to ensure that people can access the education they need wherever, whenever and however they want in order to increase their living standards (Duderstadt, 2001). Education is a phenomenon that continues in all areas of life rather than being a process just carried out at school.
The EIN platform, which provides the opportunity for the continuation of education outside of the school, is made accessible to individuals from anywhere where internet access is available and thus, it is intended to ensure the integration of technology into education.

It was decided to suspend face-to-face education in our country as of March 13 due to the Covid-19 pandemic affecting the whole world, and continue the courses through distance education. At first, distance education is started through EBA TV. Afterwards, the distance education process that will allow teachers to provide live courses from the EBA platform has started. Distance education is a system where people meet their educational needs whenever and wherever they want, using technological devices (Ozsoy, 2010). There are some institutions in our country that have preferred to use the distance education system for many years and continue their courses in this manner. However, during the recent period, distance education has become a necessity rather than being an option, as face-to-face education cannot be carried out. Distance education is a new practice and process both for teachers serving for Ministry of National Education and for students studying at schools affiliated to MoNE. Teachers had difficulties in adapting to this process as well as students.

In addition to the ability of information technologies to transmit information everywhere through the internet, its ability to store, maintain and reuse information makes it an effective model for education as well (Horzum, 2003; cited in Gurer et al., 2016). As a result of its ability to store and transmit information, it provides the opportunity to reach a great amount of people all at once. Using computer technology in distance education proves that education can be carried out simultaneously or asynchronously regardless of time and place. All types of activities that can be carried out in a classroom environment can also be actively carried out in distance education. As a result, it has been ensured that the students continued their education-training lives and not stayed away from their courses and it was tried to prevent them from cutting their ties with their schools.

Distance education using EBA platform is being provided through live lessons. Live lesson is a type of virtual learning practice where students and teachers attend the same lesson from different places at the same time. While it is possible to actively use EBA contents in live lessons, different contents (power point, video, pdf file, etc.) can also be uploaded to the EBA platform and accessed by teachers and students.

Even though distance education provided using EBA has advantages when compared to face-to-face education, it also has certain disadvantages that prevent education from being effective (Altınisik et al., 2016).

Distance education is an effective teaching method since it provides the opportunity to receive education from anywhere where there is internet access. However, it is less effective when compared to face-to-face education as it is a process where the teacher and students cannot make eye contact and there is no mutual interaction.

LITERATURE REVIEW

There are various studies on distance education in the literature. In his study, Ozer (2011) examined distance education in terms of student and lecturer opinions and concluded that lecturers have negative thoughts regarding the evaluation and content parts of the program, and positive opinions regarding the purpose and process parts of the program, and that the students have a positive view regarding the evaluation part of the program.

Mercan (2018), in the study carried out in order to determine the opinions and readiness of university students about distance education, concluded that the majority of students have positive approaches towards distance education.

Erfidan (2019), in the study carried out to research the opinions of lecturers and students regarding providing lessons through distance education, concluded that students did not find distance education generally advantageous, but were satisfied that its used for common courses.

Ozen & Baran (2020) examined teachers' attitudes towards distance education in terms of different variables in the study they carried out, and concluded that teachers who have less years of service compared to those with more, teachers with higher education status than lower, and those with more weekly EBA use compared to those with less had more positive attitudes towards distance education.

Ozbay (2015), in the study carried out to determine the current situation of distance education in the world and in Turkey concluded that distance education activities have recently increased in Turkey.

Fidalgo, Thormann, Kulyk & Lencastre (2020), as the result of the study carried out in order to determine the perceptions, attitudes and willingness of students from different countries to try distance education, established that the most significant concerns of students regarding distance education programs are time management, motivation and English language skills.

Arthur-Nyarko, Agyei & Armah (2020) researched whether distance education students are ready to use digital learning materials and found out that the majority of students are ready to use digital learning materials.

Since there isn't any qualitative study conducted on mathematics teachers regarding distance education with EBA, which is a new practice in our country, a deficiency was observed in this regard. This study was conducted to set forth the opinions of mathematics teachers about distance education carried out using Educational Informatics Network (EBA). Answers to the following questions will be sought depending on this purpose:

- What are the opinions of mathematics teachers about distance education carried out using EBA?
- Can distance education be as effective as face-to-face education?
- What are the opinions of mathematics teachers on whether distance education is beneficial for students or not?
- What are the problems encountered in distance education lessons?

- To what extent can interaction be provided in distance education?

METHOD

Research Model

The case study method, one of the qualitative research methods, was employed in this research. The case study method enables in-depth analysis of the subject being researched and aims to explain the theories (Merriam, 1998; Yildirim & Simsek, 2011; Cepni, 2018). Content analysis technique, which is one of the qualitative research techniques, was used in the collection, analysis and interpretation of the data obtained in the research. Qualitative research is a research where a qualitative process is followed in which qualitative data collection methods such as observation, interview and document analysis are used (Yildirim & Simsek, 2011). Interview which is one of the qualitative data collection techniques was preferred in this study.

Study Group

The study group of the research was determined by using easily accessible sampling method, since working on a sample of the teachers who work in Giresun province of Turkey and continue to provide distance education with EBA on a voluntary basis will provide practicality in the study (Yildirim & Simsek, 2011). The participants, consisting of 6 women and 4 men, are from different age groups.

Data Collection

A semi-structured interview form consisting of 8 open-ended questions has been prepared in order to determine the opinions of the participants on distance education with EBA (Annex 1). The semi-structured interview form consisted of 8 open-ended questions in its final form. The data obtained were coded by a researcher and a field education specialist and the reliability of the interview was found to be 83% for all questions. Content validity of interview questions was ensured by taking the opinions of experts in the field of field education and educational sciences. The necessary corrections were made in the semi-structured interview form and then it was proceed with the implementation. Since the Covid-19 disease, which is accepted as a pandemic globally by the World Health Organization, is fatal and also due to its rapid spread, it was not possible to meet mathematics teachers face-to-face and thus they were called by phone and their answers were noted. The answers acquired from these calls were gathered together in MS Word documents.

Data Analysis

The data collected in the research were analyzed using content analysis technique. The aim of content analysis technique is to analyze the obtained data in depth and reach previously unknown themes and dimensions (Cepni, 2018). Themes were created based on the data obtained after the application and the frequencies of the themes were determined and presented in tables. The answers provided by the participants were included as raw data in a way to support the data analyzed.

Participants were provided with necessary explanations before being asked any questions and were asked to give sincere answers, and it was stated that they would be safe and not suffer any consequences due to participating in the study. The obtained findings were analyzed by two researchers and common themes were formed and the frequencies of these themes were established and the quality of the study was tried to be increased. It was stated that the names of the teachers participating in the study would be kept confidential and it was tried to ensure anonymity with the codes assigned to them (T1, T2…).

FINDINGS

The findings obtained from the data regarding the opinions on distance education with EBA of 10 mathematics teachers working in Giresun province are presented in this section. The names of the participants were kept confidential, the data were displayed in tables using the codes assigned to them, and supported with raw expressions.

Teachers' opinions on the question "Have you received any training (in-service, professional development, etc.) about using Educational Informatics Network (EBA) and distance education? How did this situation affect the distance education process for you?"

The first question was asked to the participants in order to determine whether they received any training on EBA use and distance education or not, and the data obtained are presented in Table 1.

Table 1. Teachers' opinions on the question "Have you received any training (in-service, professional development, etc.) about using Educational Informatics Network (EBA) and distance education? How did this situation affect the distance education process for you?"

Themes	Sub themes	Participants	*f*
I have received training	Had a positive effect	T1, T3, T4	3
I have not received training	Had no effect	T2, T5, T6, T8	4
	Had a negative effect	T7, T9, T10	3
Total			10

Table 1 reveals the teachers' answers to the question "Have you received any training (in-service, professional development, etc.) about using Educational Informatics Network (EBA) and distance education? How did this situation affect the distance education process for you?". Since distance education with EBA is a new process, based on the answers given, it has been observed that many of the mathematics teachers have adaptation problems to this practice. 3 of the participants stated that they had received training and this training had a positive effect on the distance education process. 7 of the participants stated that they had not received any education, and 4 of those who did not receive education stated that this situation did not affect the distance education process for them, and 3 of them stated that not being able to receive education had a negative effect on the distance education process. The participant with the code T1 answered as follows: *"I attended the distance education course provided in the professional development section of the website regarding EBA and watched the videos there. This situation helped me understand the system and teach my lessons more comfortably." and the participant with the code T5 answered as follows: "I have not received any training. I was already using it at school. It did not have an effect. I just watched training videos."* and the participant with the code T2 answered as follows: *"I had received training about the use of EBA before in professional studies. However, I did not receive any training related to distance education. I got acquainted with the process by watching videos myself and by consulting my teacher colleagues. In this way, I have increased my command of the subject. I think it's simple and straightforward to use anyway. I did not have the need to get a training."* and the participant with the code T9 answered as follows: *"I did not receive any training. This situation caused me to be inexperienced at first, but I tried to overcome it over time."*

Teachers' opinions on the question "Do you think distance education with EBA is beneficial for students? Please explain and provide reasons for your answer."

This second question was asked to the participants in order to determine whether distance education is beneficial or not, and the data obtained thereof are presented in Table 2.

Table 2. Teachers' opinions on the question "Do you think distance education with EBA is beneficial for students? Please explain and provide reasons for your answer."

Themes	Sub themes	Participants	*f*
Beneficial	Experience proving that education can be provided under any circumstance	T2, T6, T9	3
	Preventing them from cutting their ties with the school	T7, T9	2
Partially Beneficial	Low interaction	T1	1
	Financial impossibilities	T3, T5, T8, T10	4
	Inconvenience of physical conditions	T4, T10	2
Total			12

Table 2 reveals the teachers' answers to the question "Do you think distance education with EBA is beneficial for students? Please explain and provide reasons for your answer." The most frequently mentioned answer among the benefits of distance education was that it provides the experience that education can be given under any condition, and there were quite a few teachers who responded that distance education was not beneficial enough due to financial impossibilities.

It is concluded that distance education is beneficial for students based on the answers given by 40% of the teachers participated in the study, and the remaining 60% of the participants stated that distance education was partially beneficial for students. The participant with the code T2 answered the question as follows: *"The students had a learning experience regardless of time and place."* and stated that distance education was beneficial because it proves that education can be provided and received under any condition.

The participant with the code T7 answered as follows: *"Yes, I think so, because the students have contributed to their development process by not cutting their ties with the school in these challenging times."* and stated that distance education was beneficial because it prevents students losing their connections with the school. The participant with the code T9 answered as follows: *"I think distance education with EBA is beneficial for students. In this way, students were able to continue with their lessons. The students saw that education and training can continue under all conditions.* and stated that distance education was beneficial in both regards.

Among the teachers who stated that distance education with EBA was partially beneficial and who was assigned the code T1 stated as follows: *"I think it is partially beneficial for students. It cannot replace the education carried out in a classroom. Because not all students have the same equipment and the same physical conditions. For example, we have students who try to attend distance education lessons in a room with a television or with their siblings which decreases the efficiency."* The participant with the code T4 answered as follows: *"I think it is partially beneficial, because some students are at a disadvantage because they do not have internet access and computers because they live far from city centers."* and the participant with the code T5 answered as follows: *"It is beneficial for students who have the opportunity to attend and follow the lessons continuously. It is also useful in terms of repeating lessons, they can repeat as many times as they want. They can solve questions. But I don't think it is as effective as in school in terms of teaching a lesson through EBA which they haven't learned before."*

Teachers' opinions on the question "What are the problems you encounter during distance education with EBA? What kind of solutions would you suggest to these problems?"

This third question was asked to the participants in order to determine the problems they have encountered in the distance education process and the data obtained thereof are presented in Table 3.

Table 3. Teachers' opinions on the question "What are the problems you encounter during distance education with EBA? What kind of solutions would you suggest to these problems?"

Themes	**Participants**	***f***
System-related problems	T1, T3, T5, T6, T7, T8, T10	7
Low participation	T4, T5	2
Lack of equal opportunity	T2, T4, T6, T9	4
Inexperience	T9	1
Total		14

Table 3 reveals the answers of teachers to the question "What are the problems you encounter during distance education with EBA? What kind of solutions would you suggest to these problems?" 5 of the mathematics teachers participated in the study stated that they had problems related to the system the most, 1 of them stated that they had problems related to both the system and the low participation of students.

1 of the mathematics teachers stated that he/she had problems due to the lack of equal opportunities as well as the problems related to the system, and another 1 of them stated that he/she had problems related to both lack of equal opportunity and inexperience. Another 1 of the mathematics teachers stated that he/she had problems due to low participation and lack of equal opportunity, while 1 of them stated that lack of equal opportunity could be a problem.

Participant with the code T1 answered as follows: *"There can be systemic problems. The system can drop us from the lessons or we can have difficulties when connecting to the lessons. Its infrastructure needs to be developed to overcome these problems."* and the participant with the code T5 responded as follows *"We generally have problems related to the system and the most important problem is the lack of student participation."* The participant with the code T4 answered the question as follows: *"Since there are very few students attending the lesson, the students cannot benefit from the education process sufficiently. Since there is no face-to-face training, the communication process cannot be experienced. Every student should have internet access and tools such as computers."* The participant with the code T9 answered the question as follows: *"The most important problem I encounter is that not every student has internet access and some students cannot use EBA."*The participant with the code T6 said that there were problems due to system density and continued as follows: *"In order to avoid intensity on a classroom basis, it may be a solution to distribute the lessons into days instead of spreading them over the week. In addition, students can be provided with the opportunity to use the internet."*

Teachers' opinions on the question "Do you think EBA content is sufficient for distance education? Why?"

This fourth question was asked to the participants in order to determine whether the EBA content was sufficient for distance education and the data obtained are presented in Table 4.

Table 4. Teachers' opinions on the question "Do you think EBA content is sufficient for distance education? Why?"

Themes	Sub themes	Participants	*f*
Sufficient		T4, T5, T6, T7, T8, T9, T10	7
Not sufficient	Not Enough Interactive Content	T1, T2, T3	3
	Courses Not Being Recorded	T2	1
Total			11

Table 4 reveals the answers of teachers to the question "Do you think EBA content is sufficient for distance education? Why?" 70% of the mathematics teachers who participated in the study stated that EBA content was sufficient for distance education, while 30% stated that it was not sufficient. It is seen that all mathematics teachers who stated that EBA content is not sufficient for distance education think that it is not sufficient due to the lack of interactive content, and that one of them thinks that it is not sufficient because the lessons are not recorded and the system does not provide the opportunity to watch the lessons later on.

Participant T8 who stated that it was sufficient answered the question as follows: *"I think EBA content is sufficient for distance education. Because there are documents available such as books, questions, videos about the courses."* and the participant T5 answered as follows *"I think it is sufficient for the science branch. There are very good activities and animations related to my branch."* Participant with the code T3 who stated that it was not sufficient since there were not enough interactive content answered the question as follows: *"I don't think there are sufficient resources in terms of my field. Even though there are more resources and lectures in other branches, there are not enough resources in the field of English."* and the participant with the code T2, who stated it was insufficient since the contents were not enough and the lessons were not being recorded answered the question as follows: *"EBA content has improved since its beginning, it is an active platform rather than a static platform, but of course it has deficiencies. For example, interactive activities related to lessons can be increased. Country-wide exams can be held frequently for students preparing for exams. Besides, I think that some branches are less focused (such as music, information technologies, physical education). Also, the lessons can be recorded and a tape broadcast can be provided for students who cannot watch them live at that moment."*

Teachers' opinion on the question "Do your students participate in the lessons that you provide through distance education via EBA? If there is not enough participation, what could be the reasons for this?"

The data obtained from this fifth question asked to mathematics teachers in order to determine student participation are given in Table 5.

Table 5. Teachers' opinion on the question "Do your students participate in the lessons that you provide through distance education via EBA? If there is not enough participation, what could be the reasons for this?"

Themes	Sub themes	Participants	*f*
Sufficient participation			
Low participation	Financial impossibilities	T1, T2, T4, T5, T6, T8, T9, T10	8
	Physical conditions	T1, T7, T8	3
	Being engaged in agriculture	T1, T7	2
	Negative motivation	T3	1
	Insensitive parent and student	T5, T6, T8	3
	Inexperience	T5, T9, T10	3
	System-related problems	T9, T10	2
Total			22

Table 5 reveals answers of mathematics teachers to the question "Do your students participate in the lessons that you provide through distance education via EBA? If there is not enough participation, what could be the reasons for this?" It is seen that the answers provided by all the mathematics teachers participating in the study state that there is not enough participation. 80% of the teachers who stated that the participation was low said that they did not attend the courses due to financial difficulties, 30% of them stated that it was due to inadequate physical conditions, 20% stated that it was due to helping their families related to agriculture, 10% of them stated that it was due to negative motivation of students, 30% of them said that it was due to insensitive students and parents, 30% said that it was due to inexperience and 20% of them stated that it was due to the problems related to the system.

The participant with the code T1 who stated that the participation is low, answered the question as follows: *"Our student participation is above the average of the class size. But it is not at the desired level, of course. Our students who do not have any internet access or who live in places where no internet is available are not able to participate in the lessons. Another reason is that because we live in the Black Sea region, our students may not be able to attend classes due to gardening works."* the participant with the code T3 answered as follows: *"There is not enough participation. The number of students related to the school and courses is very low in terms of student profiles, the fact that there is no attendance requirement is a negative motivation for the students and the fact that the ministry told the students that they are directly passed to the next grade, decreases the participation."* The participant with code T5, who stated that the participation is low, answered the question as follows: *"In general, participation is very low. There reasons are: Inadequate technological opportunities of the students. Insensitive and indifferent parents. This is the first time this practice is implemented."* and the participant with the code T7 answered as follows: *"There is not enough participation because there is no internet in the homes of students in rural areas and they help their families because of the intensity of agricultural work in this period."* The participant T9 answered as follows: *"Unfortunately, there is not enough participation to the lessons we provide through EBA. The reasons for this are the fact that not every student has an internet connection, some students cannot use EBA, and cannot enter the lessons due to system-related problems."*

Teachers' opinions on the question "The importance of student-school-parent cooperation in the education and training process at school is frequently emphasized. Do you think this cooperation can be achieved in distance education? Why?"

The sixth question of the study was asked to the participants in order to determine whether a student-school-parent cooperation could be achieved in the distance education process, and the data obtained thereof are given in Table 6.

Table 6. Teachers' opinions on the question "The importance of student-school-parent cooperation in the education and training process at school is frequently emphasized. Do you think this cooperation can be achieved in distance education? Why?"

Themes	**Sub themes**	**Participants**	***f***
Cooperation cannot be achieved	Insensible parent	T1, T2, T3, T4, T5, T6, T7, T8, T9	9
	Inexperience	T10	1
Total			10

Table 6 reveals the answers of mathematics teacher to the question "The importance of student-school-parent cooperation in the education and training process at school is frequently emphasized. Do you think this cooperation can be achieved in distance education? Why?" 9 of the participants stated that cooperation could not be achieved due to the insensibility of the parents, and 1 of them said it was because they were inexperienced and could not attend the parents' meetings held via EBA.

The participant with the code T7 answered the question as follows: *"Conscious families receive information by calling, of course, but there is a lack of communication with other families on this issue."* and the participant with code T2 responded as follows: *"The parents who are caring towards their children are always there for their children. The opposite is also true. Parents who did not care about education when it was carried out at schools were not there for their children during this period as well. I, as a teacher and together with our administrators, we tried to inform and notify our parents about the process as much as we could. However, there were a few parents we couldn't reach."*

The participant with the code T10 answered the question as follows: *"Our parents have difficulties in using technology. There was very low participation in the meetings we tried to hold during the distance education process."*

Teachers' opinions on the question "Is distance education advantageous compared to other types of education? Please explain."

The seventh question was asked to the participants in order to determine their opinions about whether distance education is advantageous or not, and the data obtained there of are presented in Table 7.

Table 7. Teachers' opinions on the question "Is distance education advantageous compared to other types of education? Please explain."

Themes	**Sub themes**	**Participants**	***f***
Advantageous	Support for face-to-face education	T1, T5	2

	Attention and motivation	T2	1
	Use of technology	T6	1
Disadvantageous	Low interaction	T3, T6, T8, T9, T10	5
	No feedback	T4, T7	2
Total			11

Table 7 reveals the answers of mathematics teachers to the question "Is distance education advantageous compared to other types of education? Please explain." 2 of the mathematics teachers who stated that distance education is advantageous stated that it was advantageous in terms of supporting face-to-face education, 1 of them stated it was because it could lead to better attention and motivation, and 1 of them stated that it was because it was beneficial in terms of technology use.

One of the participants, T1 answered the question as follows: *"If it can be provided after face-to-face training, and provided together then it would be advantageous."* and the participant T2 stated as follows: *"I saw that the students were able to focus more on the lesson in distance education. Issues such as attention problems and noise in the classroom encountered in face-to-face education are not experienced on this platform. Many students in the classroom were timid, especially in mathematics class. Here, they received an education in an environment where they felt comfortable, away from social pressure."* Participant with the code T6 answered this question as follows: *"It is advantageous in terms of saving time and use of technology, but it cannot replace one-to-one education in terms of appealing to all feelings of the student and making the subject more understandable."*

Among the mathematics teachers who stated that distance education was disadvantageous, 5 of them stated that it was disadvantageous because of low interaction and 2 of them stated that it was disadvantageous because no feedback was provided. Participant T3 answered the question as follows: *"No, it's not advantageous. I don't think we can get the efficiency we have in one-to-one interactive training."* and participant T8 answered the question as follows: *"It is not advantageous when compared to face-to-face training. Because the most advantageous environment is a classroom environment where the teacher and student interact and the teacher can have access to all children."*and the participant with the code T10 responded as follows: *"It's not advantageous. The most efficient education is provided when we are together with the students in the same environment and we can share mutually."*

Participant with the code T6, who stated that distance education is advantageous in terms of technology use and disadvantageous in terms of less interaction answered this question as follows: *"It is advantageous in terms of saving time and use of technology, but it cannot replace one-to-one education in terms of appealing to all feelings of the student and making the subject more understandable."*

Mathematics teachers' opinions on the question "Do you think there is interaction in distance education? Please explain."

The eighth question was asked to the participants in order to determine their opinions on whether there was any interaction in distance education, and the data obtained there of are presented in Table 8.

Table 8. Teachers' opinions on the question "Do you think there is interaction in distance education? Please explain."

Themes	**Sub themes**	**Participants**	***f***
There is interaction	Positive psychology	T7	1
	Interest and will	T6	1
	Live lessons	T3	1
Low interaction	Technical issues	T1, T2, T8, T9	4
	Lack of attention	T1	1
	Inability to see the person's behavior and movements	T4, T5, T10	3
Total			11

Table 8 reveals the answers of mathematics teachers to the question "Do you think there is interaction in distance education? Please explain." 30% of the mathematics teachers stated that there was interaction and 70% stated that the interaction was low.

One of the mathematics teachers who stated there was interaction, who is participant T7 answered the question as follows: *"There is interaction. At least hearing the voices of the students and seeing their face contributes to them*

and us psychologically. I think there is still interaction in terms of education" and stated that there is an interaction because it provides a positive psychology. The participant with code T6 answered the question as follows: *"Education is not a one-sided process. So as long as there are interested and willing students, there is interaction."* and stated that interaction was possible with interested and willing students. Participant T1, who stated that the interaction was low, responded to the question as follows: *"There is absolutely interaction but it is not sufficient. Because during the lesson, voices can interfere with each other, the sound may not be received by the opposite side, freezing may occur, and the student's attention may not be sufficient as in the classroom environment. This, of course, prevents the interaction from being at the desired level."* and stated that the interaction was low due to both technical problems and lack of attention. The participant with the code T4 answered as follows: *"There is very little interaction because we do not see the behavior and movements of the students, so there is no effective communication."* and stated that there was low interaction due to the inability to see each other.

CONCLUSIONS AND DISCUSSIONS

In this research, it was aimed to determine the opinions of mathematics teachers on distance education using the Educational Informatics Network (EBA). As a result of interviews conducted with mathematics teachers who attend distance education lessons through EBA, it was seen that mathematics teachers have both positive and negative opinion on distance education.

According to mathematics teachers, the distance education lessons provided through EBA motivated students during the time they had to stay away from school, ensured that their ties with the school remained the same, and provided the experience that education can be received at any time and under any condition. Distance education is beneficial as long as students can attend classes. However, since not every student has the same opportunities, it contradicts with opportunity equality in education. According to many mathematics teachers interviewed, the number of students who do not have internet access and computers at home, who live in places where internet is not available and therefore cannot attend classes is quite high.

Both students and mathematics teachers had difficulty adjusting to the system as they experienced the distance education process for the first time. The fact that students and teachers are not used to distance education process and do not have the required competencies for distance learning-teaching reduces their participation and performance in classes (Johnson, 2008).

Mutual communication can be established with students in face-to-face education, and their behavior in the classroom can be observed (Gurer, Tekinarslan, & Yavuzalp, 2016). However, in distance education lessons, adequate interaction cannot be established with students. This is because the inability to see the behaviors and movements of the students and inability to make eye contact damages one-to-one interaction. This proves that face-to-face education is more efficient than distance education.

Students should be able watch the recorded lessons later on since there is no obligation to attend classes (Gurer, Tekinarslan, & Yavuzalp, 2016). However, there is no such advantage in distance education provided through EBA. Since the lessons are not being recorded, students cannot watch them later.

The major problem teachers encounter in terms of distance education lessons is that students cannot attend the lessons. Different circumstances of students, financial difficulties, unfavorable physical conditions, and inexperience in using technology are among the reasons for not attending the lessons. As stated by most of the teachers, there are also problems that are not related to the students and caused by the system. Especially during the pandemic, there have been difficulties in entering lessons due to the intensity of the distance education through EBA, which is a new practice that covers all of the students in the whole country.

As stated by the teachers as well, distance education can be an effective education method only if the participation of students in the lessons is at the desired level. If students' participation and interest in the lessons can be increased, teachers' satisfaction levels will be at the desired level as well (Bolliger & Wasilik, 2009).

RECOMMENDATIONS

Live lessons carried out through distance education are not recorded on the EBA platform. In terms of the efficiency of distance education, if lessons are recorded, students may have the opportunity to watch the lessons they missed. Infrastructure arrangements can be made to improve the technical problems encountered while entering and during the live lessons.

Adequate amount of free internet service can be provided to students in order to ensure equality of opportunity in education. Online pilot exams can be held for 8th grade students preparing for the High School Entrance Exam

(LGS) to prepare them for the exam.

In order to make generalizations about the opinions of students and teachers on distance education, quantitative data can be collected and researches can be conducted. This research has been carried out using the opinions of teachers. Studies can be conducted on students in order to set forth the opinions of students as well. Distance education and technology are interrelated phenomena. The effect of technology literacy on distance education can be investigated in this framework as well.

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Slideit+ New Ebook Reader for Personal Computer (PC) for Improved Reading Comprehension

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ABSTRACT
Reading expository text is essential in educational settings but can present challenges. eBooks bring several advantages: they are portable, searchable and efficiently stored. However, eBooks have disadvantages compared to natural books. eBooks are more rigid and fragile than natural books. Although reading on a mobile phone is more flexible than on PC (desktop or laptop), it still lacks the flexibility of a natural book. Further, mobile phones can only handle relatively small texts and are not suitable for texts with high-resolution graphics or multimedia. This study developed SlideIt+, an eBook reader for PC to target reading comprehension while drawing on eBook advantages. Thirty-four participants were grouped into three conditions: an experimental group that used the eBook reader; a control group who read natural books, and an experimental group who read natural books with a structured reading strategy that was also incorporated into the eBook reader. The eBook reader outperformed natural book reading, and performance was equivalent for the eBook reader and natural books when the reading strategy was used. SlideIt+ effectively helps comprehension of expository text on PC. The SlideIt+ eBook reader mechanism could be adapted for other eBook readers, supporting research into the integration of reading strategies into eBooks.
Keywords: eBook Reader, SQ3R, Sliding Interaction

INTRODUCTION
Reading is a conventional literacy skill that has been researched through centuries. With the advent of Information and Communication Technology (ICT), reading is no longer confined to conventional books and can be enjoyed online using an ICT version of a book usually called an eBook. However, reading with ICT has both advantages and disadvantages. The advantages are clear: the physical space required is reduced, and searching is faster. A disadvantage of eBooks is that they tend to be less flexible. Although several enhancements to hardware like mobile phones and fold phones have been made, they still cannot match natural books in terms of their flexibility. Furthermore, besides the reduced flexibility which increases reading fatigue, phones are less powerful than notebooks and desktop PCs. Reading using ICT, especially on a desktop PC or notebook, can result in increased fatigue although these devices have more power and can open multimedia documents with ease. However, as the hardware does not easily bend, readers typically remain stationary on their chairs, which can make reading monotonous, leading to loss of concentration.

This study set out to address difficulties associated with reading on PC by developing an eBook reader. Phone mechanisms for enhanced flexibility, such as sliding interaction, were incorporated into PC-based reading, an approach that has not yet been specifically adopted for reading with PCs. The study goal was to examine the result of using the eBook reader called SlideIt+, compared with baseline reading. Baseline reading in this study was a natural book, considered harder to outperform than if comparisons were made with a plain eBook reader system. SlideIt+ uses sliding interaction as movement between the desktop and an internally embedded SQ3R (Survey-Question-Read-Recite-Review) reading strategy. The study examined the effectiveness of SlideIt+ in improving reading comprehension compared with traditional book reading.

Although much research has focused on SQ3R as a reading technique when using natural books (e.g. Asiri & Momani, 2017; Biringkanae, 2018) there is little research on implementation of the SQ3R reading technique with eBook readers. Zhang, Cheng, Huang, He and Koyama (2003), and Zhang, Cheng, He, Aiguo, Koyama and Huang (2004) were the first to implement an SQ3R reading framework in an eBook reader. However their research did not evaluate the benefit of the system for participants. Pham, Chen and Dang (2011) conducted an SQ3R evaluation, but the SQ3R framework was conducted externally and not embedded in the system. Li, Chen and Yang (2013), Li et al. (2014) and Yang, Lee, Chen, Li and Yang (2011) used the SQ3R framework in an eBook reader with visual cues and variants of Kindle's visual cues, but with no sliding interaction. Super and Chen (2011) implemented sliding interaction in their reading study but did not include SQ3R. Sliding interaction has been shown to have potential to improve reading comprehension but it has not been implemented in any commercial eBook reader, e.g. PDF reader or Kindle, to date. This research was undertaken from a book perspective rather than being conceptualized as part of an electronic 'bag.' The 'bag' perspective covers many items, including the book, in detail from macro to micro. A book perspective has the book as the main focus together with other supportive items (micro to adjacent view).

THE STUDY

Materials and Rationale

SlideIt+ (with the full name of SlideIt+SQ3R) introduces a sliding interaction environment of a multiple eBook reader desktop, with an SQ3R framework. The design is presented in Figure 1.

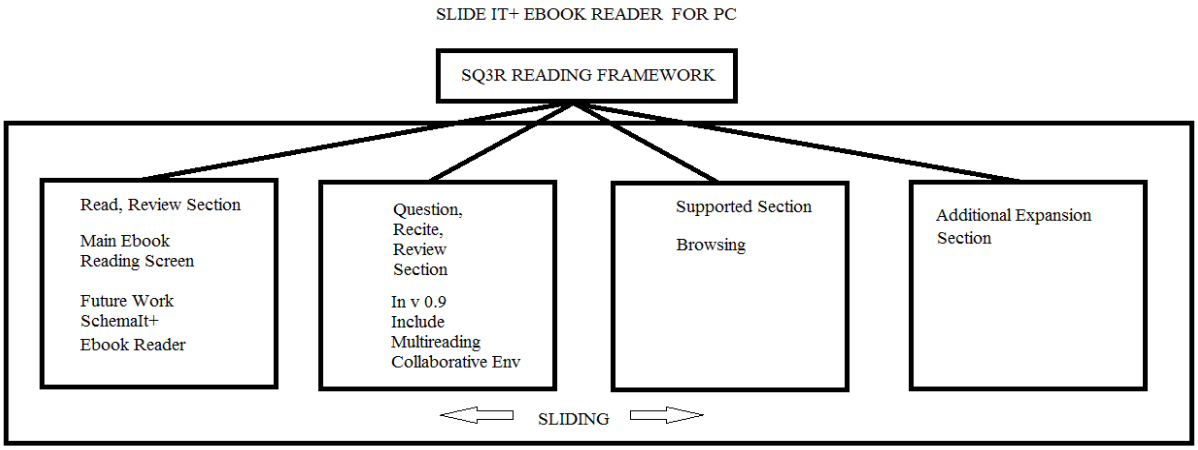

Figure 1: SlideIt+ Design

'Survey, Question, Read, Recite, and Review' (SQ3R) is a reading strategy introduced many years ago (Johns & McNamara, 1980; Pauk & Robinson, 1963). 'Survey' refers to skimming or quickly grasping the macro meaning of a text and becoming familiar with its content. 'Questioning' requires readers to generate questions based on the text. The questions may include '5W and H' (Who, what, when, where, why and how?) questions or take the form of more critical questions. 'Read' refers to detailed reading activity that occurs after generating the questions. 'Recite' is repetition of the questions previously posed while no longer viewing the text to make it more challenging. 'Review' is where the text is read again for final comprehension.

The sliding menu of the Apple iPhone is needed due to the limited screen size of a mobile phone. In PC, the screen is already sufficiently large so there is no need to have an additional desktop to display the menu. Linux Ubuntu tried to adopt a sliding menu, e.g. Ubuntu 10 Lucid Lynx has four desktops on the bottom right, but this gained little attention and the interaction was not sliding but by clicking. A sliding menu has not yet been adopted for PC – especially for reading and windows. However, given the potential to expand the desktop view, it was adopted here to expand the eBook reader desktop. The rationale for the sliding interaction was to give the perception that the entire desktop is connected – like the menu in IOS Apple or Android phones. It creates the impression that sliding to the right is an extension of the screen as the screen size of the mobile phone is limited. A similar approach was used with Ubuntu 10 Lucid Lynx. The flexible interaction of the mobile phone is very pleasing, however the computing power of mobile phones is more limited than that of desktop or laptop PC. Thus, reading complex documents with many high-resolution graphics and complex calculations or embedded media is beyond the limit of mobile phones, although PCs continue to gain momentum in terms of power.

Method

The present eBook experimental method was embedded in Woolf's (2009) framework. According to Woolf, there

are several methods for evaluating effectiveness of a new reading system. These approaches can be categorized from 'hardest' to 'easiest' comparison. The experimental group assigned the SlideIt+ eBook reader. The control group chose a natural book, but were not deprived of access to an eBook reader.

a. *Natural control group vs. treatment system*: As the natural system is usually impossible to improve on, this is the 'hardest' comparison, e.g. eye vs. computer vision, human tutor vs. computer tutor, natural book vs. experimental eBook system. A natural book has many advantages over an eBook, which means that the comparison is a challenging, rigorous one.

b. *Other eBook system vs. treatment system*: This kind of method makes a fair comparison between two similar technologies or extends previous technology, e.g. Adobe acrobat vs. treatment system.

c. *Part of treatment system vs. entire treatment system*

d. *Part of old treatment system vs. part of new treatment system*

e. *No read vs. treatment/eBook system:* This type of comparison is the least rigorous or 'easiest' one in which change could be demonstrated.

The present study used Woolf's (2009) first level of comparison where reading of natural books was compared with the experimental system. Two natural book groups were used: the first one as baseline comparison or control group and the other as the gold standard experimental comparison. The study adopted an extended control system (a+b) to make a very rigorous comparison that would be challenging to improve upon, i.e. natural book reading + SQ3R method vs. the new eBook system.

The study grouped the participants into three groups as follows:

Group A – Control group: Read a natural book with a freestyle approach for 30 minutes.
Group B – Experimental group: Used SlideIt+ reading environment. This group was also given 30 minutes to read but in practice took up to 1.5 hours due to the novelty of the SQ3R method and participants' questions about the software. Participants finished at different times, but due to the simultaneous posttest those who had completed the task needed to wait for their friend to finish. SlideIt+ operates on a 'supervised' mode with a teacher ensuring each participant conducts all of the SQ3R steps.
Group C – Gold standard experimental group: Used a natural book together with the SQ3R reading strategy.

FINDINGS

The goal was to determine whether the SlideIt+ treatment group performs better in reading comprehension than a control group, and the gold standard experimental group. Hypotheses were formulated as follows.

H_a: Treatment Group (TG) > Control Group (CG)

Thus, rendering the following formal hypothesis
H_0: TG <= CG
H_a: TG > CG
As this study only needed to determine whether TG > CG in one direction, one tailed significance was sufficient.

Table 1: Comparison of the mean reading comprehension scores for the three groups

Mean score on reading comprehension task and the standard deviation		
Group A – Control group Free style, natural book reading (n=23)	Group B – Experimental group SlideIt+ eBook reading (n=11)	Group C – Gold Standard experimental group SQ3R natural book reading (n=11)
2.91+/-1.5	5.18+/-1.89	6.27+/-1.85

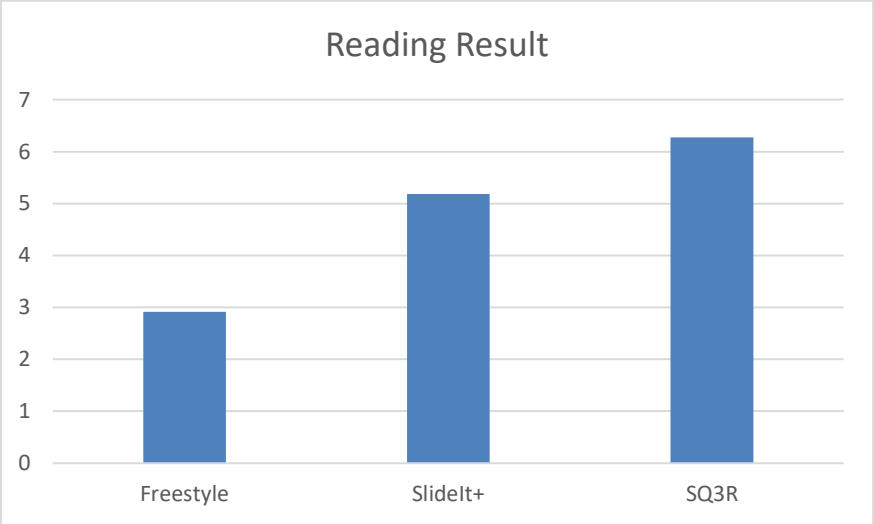

Figure 2: Mean score on reading comprehension task and the standard deviation

There are two comparisons in this result: The first between Groups A and B (freestyle natural book group vs. SlideIt+ group), and the second between Groups B and C (SlideIt+ group vs. SQ3R natural book group). In the first comparison, the experimental group significantly outperformed the control group on mean score for reading comprehension (5.18 vs. 2.91). Participants in the freestyle natural book group had not been taught how to use the SQ3R technique, unlike those in the experimental groups in which SQ3R was embedded. Group A used natural books, considered difficult to outperform due to their flexibility that makes it easier for readers to sustain attention and a comfortable viewing angle. The result shows both one (p=0.0015) and two-tailed significance (p=0.003) with both values less than alpha=5%, thus rejecting H_0 (t=3.49). SlideIt+ was shown to effectively improve reading comprehension when compared to the control group.

Table 2: Comparison of Group A (Control – Free book Reading) vs. Group B (Experimental – SlideIt+ eBook Reading) with the experimental group significantly outperforming the control group

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	5.181818182	2.913043
Variance	3.563636364	2.264822
Observations	11	23
Hypothesized Mean Difference	0	
df	16	
t Stat	3.490680942	
P(T<=t) one-tail	0.001511227	
t Critical one-tail	1.745883676	
P(T<=t) two-tail	0.003022454	
t Critical two-tail	2.119905299	

Following Woolf's (2009) control group theory, the experimental group was compared further to a more rigorous 'gold standard' experimental group: Group C, which used natural books but had been taught how to read using the SQ3R technique. Group C slightly outperformed Group B, although no significant difference was shown between the mean reading comprehension scores of the two groups (Group B: 5.18 vs. Group C: 6.27; t=-1.369). This means that students using SlideIt+ on a desktop PC or laptop can obtain learning results comparable to using SQ3R with a natural book whilst exploiting the power of a computer such as portability and ease of searching.

Table 3: Comparison of Group B (Experimental – SlideIt+ eBook Reading) with Group C (Gold Standard Experimental – Natural SQ3R book reading): No significant difference (alpha=5%)

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	5.181818	6.272727
Variance	3.563636	3.418182
Observations	11	11
Hypothesized Mean Difference	0	
df	20	
t Stat	-1.36931	
P(T<=t) one-tail	0.093042	
t Critical one-tail	1.724718	
P(T<=t) two-tail	0.186085	
t Critical two-tail	2.085963	

Within-group results were already reported by Nugroho (2013) based on an initial study. Between-group results have not yet been reported and thus are presented here. Previous results only reported on two groups and not for all three groups. The treatment group (SlideIt+ eBook reader) outperformed the control group (freestyle natural book reading) and performed comparably with the gold standard SQ3R natural book reading group. It is hard to outperform natural book reading by electronic means, especially using a PC. Natural book reading is easy as users can bend a book into any shape they want; they can hold it however they like – vertically, horizontally or at any angle. They can move the book conveniently to suit any body movement or position thus avoiding boredom and fatigue. With a PC, one tends to stay in front of the computer, which is monotonous and tiring. The SlideIt+ eBook reader can be used to boost reading comprehension so that it outperforms freestyle natural book reading and is equivalent to natural book reading used with SQ3R.

The subjective result of the study was, however, quite average (approximately 3 on a scale of 5). This result may reflect that the experimental system is a prototype version that provides a fundamental framework function but still requires further refinement.

Table 4: Least Square Method for using and not using SlideIt+ with Reading Results

SUMMARY OUTPUT							
Regression Statistics							
Multiple R	**0.556306028**						
R Square	**0.309476397**						
Adjusted R Square	0.287897535						
Standard Error	0.400714517						
Observations	34						
ANOVA							
	df	*SS*	*MS*	*F*	*Significance F*		
Regression	1	2.302868486	2.302868	14.34165	0.000635		
Residual	32	5.138307985	0.160572				
Total	33	7.441176471					
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*
Intercept	-0.173954373	0.148254694	-1.17335	0.249316	-0.47594	0.128031	-0.47594
Result	0.136406844	0.036019416	3.787037	**0.000635**	0.063038	0.209776	0.063038

Table 4 shows the regression using the least linear squares method, which generated a model as follows:
Y = -0.17 + 0.14x

The model has an error value of 0.000635 (less than 1% error) and correlation strength of 0.56; it accounts for about 0.3 of the variance in the results.

DISCUSSION

The contributions of this research are as follows:

1. The study provided a new eBook reader environment that effectively improves reading comprehension even in contrast to a natural book environment (freestyle natural book reading). The new SlideIt+ eBook reader successfully matched performance on natural book reading. It uses multiple desktops and the SQ3R reading strategy blended with sliding interaction to provide an integrated reading environment. The study provides further evidence that implementing a reading strategy in an eBook improves reading comprehension. This was described here in a novel setting with new materials, methods, and participants.
2. The research proves that embedding a reading or learning strategy in an eBook learning environment can significantly improve reading or learning. This supports previous research which has shown that implementation of the SQ3R reading strategy in eBooks improves reading comprehension (Li et al., 2013; Yang et al., 2011).

CONCLUSIONS

The SlideIt+ eBook reader provides a new eBook reader environment for PC using multiple desktops and the SQ3R reading strategy blended with sliding interaction to provide an integrated reading environment. SlideIt+ significantly improved reading comprehension compared with freestyle book reading and performed equally effectively as natural book reading using the same SQ3R technique.

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The Role of Web2.0 and Social Media Tools in Foreign Language Learning

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ABSTRACT
Learning a language in an effective way has always been considered one of the most important subjects of educational sciences. Lots of theories and assumptions have been put forward and issues have been criticized. Among all these arguments, motivating the learner and help them to improve their self-autonomy can be considered as the most vital point. In 2020, learners changed their view of the world as well as their way of learning. To be able to catch them, language teachers have numerous options to utilize in our classrooms. At this point; Web2.0 tools and SNSs (Social Networking Sites) are considered vital. Utilizing our teaching styles into MALL (Mobile Assisted Language Learning) may help us to raise learners' awareness. Designing the lessons around Web2.0 tools and SNSs motivate students to engage in collaborative learning. To test the effect of using Web2.0 tools and SNSs on the language learning process 107 high school students were chosen for the current study. The participants were already aware of using Web2.0 and SNSs tools and they had been practicing this process since September 2019. The questionnaire was applied to participants in June to collect their ideas about Web 2.0 and social media tools on foreign language education. After the test, an online interview was organized to record their authentic and sincere feelings towards the usage of those tools in foreign language education. Collected data were calculated with SPSS to be able to observe some important variables. According to the findings, it is obvious that the majority of students prefer and enjoy using Web 2.0 and social media tools in their learning process and their motivation increases naturally as they use it frequently.
Keywords: Computer-assisted language learning, Web2.0 tools, social networking sites, mobile-assisted language learning, motivation in language learning

INTRODUCTION

Generations were divided into X, Y, and Z, and their features were listed in terms of their characteristics. Generation X covers those born between 1965 and 1981, carries some unique features such as; distinctiveness, motivation, and workaholic. Generation Y is also named "digital natives" because they have grown up with technology. (1982-1994). Their major features can be listed as; work-shy, self-obsessed, and spoilt. Generation Z born between 1995 and 2010, tend to neglect their relationships in real life as they mostly live on digital platforms. Their attention span is very limited. According Low & Chaudhry (2009), generation x can be seen as the first one to face with papers, magazines and news so directing them to reading in foreign language learning is an effective way. As generation X are grown with reading-based materials, implementing reading activities to their learning environment is essential. As Bozavlı (2016) mentioned; generation Y shows positive skills in knowing how to learn however they face some problems with verbal expression and comprehension. As for generation Z; their knowledge and experience for technology is natural since they have grown up with them as daily basis, integrating technology in language learning is a must. Linguists have given importance to the generations' learning style and the best outcome has been tried to be applied to language learning. Globalization brought rapid changes for English and technology and these two important factors, English and technology, are vital elements affecting the term globalization. In other words, technology and English have a leading role in the globalization process for the current ages and generations.

Computer-assisted language learning, CALL, is also another term that we should mention as CALL deals with the relationship between learners and computers and plays a role as a foundation for technology-integrated learning & teaching environment. CALL is briefly defined in a seminal work by Levy (1997) as "the search for and study of applications of the computer in language teaching and learning". Since the 1960s, computer-assisted language learning has been seen as an important factor in language learning. Using the earliest computers was a starting

point of CALL. Later on; projection devices and smart boards have been utilized for the language learning process. Today we can also focus on CALL along with Web2.0 tools and social networking sites.

Until the 2000s Web1.0 tools and up to 2010s Web2.0 tools have been the object that researchers took into consideration. As McBride (2009) points out, Web 2.0 technologies have become a component that we can easily reach anytime and anywhere we desire and imagine. Also, Warschauer and Grimes (2007) claim that millions of active users prefer Web 2.0 technologies to interact, learn, communicate, and network while they enjoy doing it. Web 2.0 technologies seem to have profound potentials in education because of their open nature, ease of use, and support for powerful collaboration and communication (Weller, 2007). As of 2020, not only Web2.0 tools but also social media tools are such main elements in our daily lives that they are vital in our educational life, too. Web2.0 tools have become integral parts of our everyday teaching (Coşkun & Marlowe, 2015). The usage of technology also causes the researchers to investigate the question of how we can use it effectively in our lives. (Eren, 2015). In 2020, teachers who learned their foreign languages with the use of Web1.0, Web2.0, and social media tools have become foreign language teachers. So, they do not have difficulty in getting used to being a global citizen or digitally literate. But some teachers unfortunately are not successful in their transition into being a global citizen or digitally literate. There has always been a generation gap between students and teachers but, due to the fast-technological developments, this gap is greater than in the past. (Eren, 2015).

Enhancing learners' motivation in the language learning process is the most important subject. Cooker (2010) emphasized that Web 2.0 tools have had a more important place in learner's autonomy as it has gained more importance for individuals. As teachers, we need to make them feel motivated if we like to achieve our teaching goals. The best way to foster their motivation is by speaking the same language and anticipating them. Speaking the same language refers to being digital literate as they are and being a global citizen. Social Media Tools and Web2.0 Tools are very important to catch up with the ages and generations. Also, social networking sites provide learners with a great range of content based on a foreign language. Anyone can reach various videos, texts, etc. on YouTube, Google, or other social networking sites. SNSs have importance in communicating for the foreign language learning process. As Brick (2013) mentioned, the first way to start a conversation with other learners was with pen pal projects, thanks to improvements in technology, it has become possible for everyone to communicate with learners around the world. According to Brick (2013), SNSs provide learners with practicing the target language. Every kind of SNSs provides learners with different opportunity such as listening, reading, speaking or writing. Decorating the learning environment with SNSs applications helps learners and teachers to proceed successfully in foreign language learning process. As Greenhow & Askari (2017) suggested; social networking sites are information and communication technologies that appear to encourage engagement among teachers, students, and parents.

Learners, especially teenage learners, live digitally, think digitally and most importantly, learn digitally. Our students are already digital natives as they have grown up with the current technological developments according to Prensky (2001). If teachers fail in adopting themselves into using these tools, they can lose their connection with their students. "Combining digital technology and language learning is Mobile-Assisted Language Learning (MALL). MALL broadly refers to anytime anywhere language learning activities are undertaken through mobile devices without being limited to a physical location or a determined time" (Kukulska-Hulme & Shiled, 2008). Today, there are numerous applications helping learners to get a foreign language, if teachers can adjust their teaching styles with these tools, they can easily complete their aims in terms of language teaching. The effect of SNSs on language learning is described by Godwin-Jones (2005) as "disruptive technologies" as they carry a potential in which the learners can manage writing, speaking, listening, and reading tasks. Anytime and anywhere, being able to reach sources is vital in language learning for learners. According to the finding of Alnujaidi (2017) SNSs effects on students can be listed as; a) participants' positive attitudes, b) positive perception and expectation c) the relationship between experience and attitude & experience and expectation are calculated positive d) participants agreed to clarify that SNSs help them in learning foreign language e) creating a fun learning environment is another point of participants' view f) participants wished to utilize SNSs inside & outside of the classroom. Alnujaidi (2017) expressed that learners should be provided with SNSs throughout their learning experience also an expert should be ready for them when they need.

In literature, there are lots of studies on how to improve learners' motivation by using Web2.0 tools social media applications. According to Basal (2004) "if Web 2.0 tools are integrated properly into language lessons, teachers can create a more engaging, interactive and motivating learning environment in their lessons". These tools can create such a learning atmosphere since they promote creativity, collaboration, and communication, and they dovetail with learning methods in which these skills play a part (Solomon & Schrum, 2007, p21.) Correspondingly, this study is an attempt to discover how effective these tools are in English as a foreign language context. Some students are already familiar with these tools and they have been using Web2.0 tools and social media applications

from a very early age. When they come into the physical classroom environment, they try to find a way to connect themselves to the digital world. Helping learners to control their learning is more important than providing them a natural environment for Web 2.0 tools (Aşıksoy, 2018). In today's classrooms, Web 2.0 technology is embedded in instruction as a way to provide inexperienced persons with social constructivist surroundings in all kinds of instructional institutions (Cochrane & Bateman, 2008). Making them use Web2.0 tools and social media applications is very helpful for them to get used to the learning process. While adjusting teaching into the syllabus, teachers have to label these tools as 'helpful in learning'. Technology-integrated lessons are expected to improve the interaction between students and teachers. (Özkan, 2011). With the help of this, every outcome can be thought of with Web2.0 and social media tools. These developments and the popularity of Web 2.0 tools have made researchers conduct surveys about how effective they are. (Tılfarlıoglu, 2011). Given that, the present study aimed to examine how Web2.0 Tools and social media applications are effective in language teaching and to what extent the learners can maximize their learnings. Students involved in the research were already familiar with Web2.0 and social media tools and they were almost experts in utilizing them in their learning. During this research, with the help of a designed questionnaire and personal interviews, these research questions are aimed to be highlighted:

(1) What are the students' points of view on Web 2.0 and social media tools?
(2) What are the impacts of Web2.0 tools and social media applications in terms of positive attitudes, effects on language skills, and sub-skills, future implications?
(3) How related are Web2.0 tools and social media applications regarding the variables of positive attitudes, effects on language skills and sub-skills, future implications sub-sections of the questionnaire?
(4) What positive and negative aspects are associated with Web2.0 tools and social media applications in the language learning process after the interview with the students?
(5) How do the feelings of students using Web2.0 and social media tools differ from each other?
(6) What themes are produced related to the use of Web2.0 and social media tools by the students according to the semi-structured interview?

METHOD

Research Design

This study was designed as a mixed-method study and combined both the qualitative interview reflections and quantitative questionnaires conducted on the participants. As Dörnyei propose (2007) the diversity of methodology has reached at the crossroad which appeared in two ways of the consideration of statistical applications and searching for the answers of how questions to reach the nature of the phenomena under the scope, the distinction of qualitative and quantitative methodologies need to be seen as mutually exclusive for the current studies. Although the components of the content of the mixed-method designs can be difficult to ensure for the researchers (Wisdom, Cavaleri, Onwuegbuzie, et al., 2011), it may foster the qualitative and quantitative findings of the studies by showing a deeper understanding of the contradictions or limitations they may have (Creswell & Plano Clark 2011).

Participants

One of the probability sampling methods known as cluster sampling that requires the division of the population randomly or systematically was chosen to be used in the survey. For carrying out the research; high school students who were already familiar with utilizing Web2.0 tools and social media applications for their second language education were chosen from all around Turkey. 107 high school students from different parts of Turkey attended the questionnaire and interview. 34.6% (f=37) of them are male and 65.4% (f=70) of them are female student. Their age ranges from 14 to 18. Regarding their grades, 47.7% (f=51) of the students is 9^{th} graders, 18.7% (f=20) of them is 10^{th} graders, 30.8% (f=33) is 11^{th} graders and 2.8% (f=3) is 12^{th} graders.

Researchers tried to collect data from all over Turkey and achieved to reach 107 different students from 14 different cities as involved in the questionnaire. As illustrated in the table, 3.7% (f=4) of them is from Aksaray, 0.9% (f=1) is from Ankara, 0.9% (f=1) is from Denizli, 56.1% (f=60) is from Erzincan, 13.1% (f=14) is from Isparta, 15% (f=16) is from Istanbul, 4.7% (f=5) is from Konya, 0.9% (f=1) is from Manisa, 0.9% (f=1) is from Muğla, 0.9% (f=1) is from Karaman, 0.9% (f=1) is from Antalya, 0.9% (f=1) is from Mersin, 0.9% (f=1) is from Sinop.

As mentioned above, all of the participants are aware of Web2.0 Tools and Social Media Applications, moreover, they currently use them as a part of their English learning process. For the interview part; only 34 students were chosen because of the Coronavirus outbreak and interviewing all of the participants was impossible to conduct. Organizing more participant involvement was impossible for the researcher, thus 34 volunteer students were asked 6 basic questions mentioned in Data Analysis. The requirement of this process in the pandemic outbreak resulted in the combination of applying purposive sampling which is known as subjective or selective along with the above-mentioned non-probability sampling. That is to say, as Creswell and Plano Clark (2011) point out that the

purposive sampling is a method to be used to provide data sources when effective and limited number of the participants will shape the nature of the research conditions in terms of its objectives and aims.

Data Collection

Google Docs was used for the questionnaire part with 175 different questions. The link to the questionnaire was sent via WhatsApp to make them join the research. In 2 weeks, all of the students completed their tasks. After two weeks; an individual interview was planned but due to the Covid-19 outbreak, all of the interviews were to be held via Skype or Google Hangout to collect data based on their personal experience. With the help of the technological devices letting us connect, the interview section was completed in 2 weeks and their feelings have been recorded and written down. A mixed-method is a research approach whereby researchers collect and analyze both quantitative and qualitative data within the same study (Bowers, 2013). To be able to conduct the research, the students were asked to participate in a questionnaire and to join an interview section to gather their responses. To detect their attitudes towards Web2.0 Tools and Social Media Application in the language learning process, a questionnaire consisting of 15 related questions was applied. After collecting data from the questionnaire, an interview section consisting of 6 questions was held for 34 students via Skype or Google Hangout. To be able to make data collection for the interview more practical, some keywords were created and inserted into a chart (Table 1.0). While interviewing them, for every student, keywords were underlined as they mentioned it. At the end of the interview section, the researcher had numbers for each keyword such as; 'How many students mentioned enjoyable activity? or 'incentive for speaking?' To ensure comprehension check with the questionnaire, Turkish and English were used together with questions and answers. In the questionnaire, participants were represented with 4 possible answers (strongly agree- agree- disagree- strongly disagree) for each question. With the number of 21 items, the reliability of the article has been calculated as .85 on SPSS, which is accepted as applicable for the questionnaires carried out in social and educational sciences.

In the interview section of the research, every student had a chance to express themselves in terms of research questions freely. Web tools such as Skype and Google Hangout were used to communicate. The following questions were directed to participants;

- What do you think of Web2.0 tools and social media applications?
- What difference do you see in yourself? In terms of English learning?
- Do Web2.0 tools and social media applications contribute to your language learning?
- How do you feel while using them?
- Do you have any problems with using them?
- Do you recommend them to others?

Based on the participants' answers, tables presented in the following findings part were created to be able to list them as positive aspects and negative aspects of using Web2.0 tools and social media applications in the English language learning process.

Data Analysis

Data collected from participants were analyzed by using the package program of SPSS. For descriptive statistics of students' points of view on Web 2.0 tools, students' answers were calculated with percentages based on their answers. In terms of descriptive statistics of sub-sections of scale on Web 2.0 tools, responses from students were compared with four main aspects; positive attitudes, effect on skills, the effect on sub-skills, and future implications. Also, the correlation of each sub-section was represented with Pearson Correlation results. As for students' feelings when their teacher uses Web 2.0 tools and social media applications in their learning atmosphere, the Kruskal Wallis H test was used. For the interview part of the research, categorized descriptive statistics of semi-structured interview results were represented with frequencies and percentages together based on the content analysis approach.

FINDINGS

This section includes descriptive statistics and analytical results of the questionnaire used in the research.

Table 1. Descriptive statistics of students' points of view on Web 2.0 and social tools

Items of the Scale	Strongly Agree		Agree		Disagree		Strongly Disagree	
	f	%	f	%	f	%	f	%
1- I am experienced in using Web 2.0 tools and social media applications.	25	23.4	61	57.0	18	16.8	3	2.8

2- I can learn English by using Web 2.0 and social media applications.	31	29.0	54	50.5	17	15.9	5	4.7
3- I believe Web 2.0 tools and social media applications have a positive impact.	35	32.7	46	43.0	20	18.7	6	5.6
4- Web 2.0 tools and social media applications are effective in EFL.	40	37.4	51	47.7	10	9.3	6	5.6
5- Web 2.0 tools and social media applications make EFL more enjoyable.	44	41.1	41	38.3	17	15.9	5	4.7
6- Web. 2.0 tools and social media applications make EFL more effective.	34	31.8	50	46.7	17	15.9	6	5.6
7- Web. 2.0 tools and social media applications improve my reading skills.	35	32.7	57	53.3	12	11.2	3	2.8
8- Web. 2.0 tools and social media applications improve my writing skills.	29	27.1	56	52.3	19	17.8	3	2.8
9- Web. 2.0 tools and social media applications improve my listening skills.	40	37.4	52	48.6	11	10.3	4	3.7
10- Web. 2.0 tools and social media applications improve my speaking skills.	27	25.2	59	55.1	12	11.2	9	8.4
11- Web. 2.0 tools and social media applications improve my pronunciation.	32	29.9	56	52.3	13	12.1	6	5.6
12- Web. 2.0 tools and social media applications improve my vocabulary skills.	49	45.8	49	45.8	5	4.7	4	3.7
13- Web. 2.0 tools and social media applications improve my grammar learning.	29	27.1	56	52.3	17	15.9	5	4.7
14- There is an increase in my English learning after I started using them.	29	27.1	50	46.7	21	19.6	7	6.5
15- I would like to continue my learning process with them.	33	30.8	50	46.7	16	15.0	8	7.5

In the table, the percentages and frequencies of students' answers have been displayed. Every question consists of 4 answers; strongly agree, agree, disagree, and strongly disagree. As clearly can be seen from the table, the majority of students have positive attitudes towards Web2.0 and social media applications for their language learning process. Out of 107, 86 students chose "agree" and "strongly agree" options, which is 80.4% of the total, for the statement of "I am experienced in using Web2.0 and social media applications and 19.6% of them (f=21) chose "disagree" and "strongly disagree". 85 students chose "agree" and "strongly agree" alternatives, which is 79.5% of the total, for the "I can learn English by using Web2.0 and social media applications" and 20.6% of them (f=22) chose "disagree" and "strongly disagree". 81 students agreed with the statement "I believe Web 2.0 tools and social media applications have a positive impact" which is 75.7% of total participants and 24.3% of them (f=26) chose "disagree" and "strongly disagree". 91 students chose to agree and strongly agree options for the statement "Web 2.0 tools and social media applications are effective in EFL" which is 85.1% of them and 14.9% of them (f=16) chose "disagree" and "strongly disagree". 85 students shared their opinions by clicking on agree and strongly agree options for "Web 2.0 tools and social media applications make EFL more enjoyable" which is 79.4% of them and 20.6% of them (f=22) chose "disagree" and "strongly disagree". 84 of the students chose "agree" and "strongly agree" for the statement of "Web. 2.0 tools and social media applications make EFL more effective" which is 78.5% of total and 21.5% of them (f=23) chose "disagree" and "strongly disagree". 92 students, also, chose "agree" and "strongly agree" options for "Web. 2.0 tools and social media applications improve my reading skills" statement, which is 86% of them and 14% of them (f=15) chose "disagree" and "strongly disagree". 85 students liked to express their opinions by clicking on "agree" and "strongly agree" options for "Web. 2.0 tools and social media applications improve my writing skills" statement that is 79.4% of total and 20.6% of them (f=22) chose "disagree" and "strongly disagree". 92 students wished to express their ideas with "agree" and "strongly agree" alternatives for the statement of "Web. 2.0 tools and social media applications improve my listening skills" that is 86% of them and 14% of them (f=15) chose "disagree" and "strongly disagree". 86 students clicked on "agree" and "strongly agree" buttons for the statement of "Web. 2.0 tools and social media applications improve my speaking skills" which is 80.3% of the total participant and 19.6% of them (f=21) chose "disagree" and "strongly disagree". 88 students continued with "agree" and "strongly agree" for the statement of "Web. 2.0 tools and social media applications improve my pronunciation" that is 82.2% of them and 17.7% of them (f=19) chose "disagree" and "strongly disagree". 98 students chose "agree" and "strongly agree" options for "Web. 2.0 tools and social

media applications improve my vocabulary skills" statement, which is 91.6% of them and 8.4% of them (f=9) chose "disagree" and "strongly disagree". 85 students chose "agree" and "strongly agree" options for "Web. 2.0 tools and social media applications improve my grammar learning" statement, that is 79.4% of total and 20.6% of them (f=22.9) chose "disagree" and "strongly disagree". 79 students said "There is an increase in my English learning after I started using them" by clicking on the "agree" and "strongly agree" buttons, which is 73.8% of them and 26.1% of them (f=28) chose "disagree" and "strongly disagree". 88 students expressed that "I would like to continue my learning process with Web2.0 and social media applications" by clicking "agree" and "strongly agree", which is 77.5% of them and 22.5% of them (f=24) chose "disagree" and "strongly disagree".

Table 2. Descriptive statistics of sub-sections of scale on Web 2.0 and social media tools

Items of the Scale	Strongly Agree		Agree		Disagree		Strongly Disagree	
	f	%	f	%	f	%	f	%
Positive attitudes (6 Items with 642 answers)	209	32.55	303	47.20	99	15.42	31	4.83
Effects on Skills (4 Items with 428 answers)	131	30.61	224	52.34	54	12.62	19	4.44
Effects on sub-skills (3 Items with 321 answers)	110	34.27	161	50.16	35	10.90	15	4.67
Future implications (2 Items with 214 answers)	62	28.97	100	46.73	37	17.29	15	7.01

In this table, 15 questions were narrowed into sub-sections and statistical information was calculated based on students' answers on how many times they clicked on "agree" "strongly agree" "disagree" and "strongly disagree" options. For the first sub-section, positive attitudes (6 items with 642 answers), 79.75% of answers are (f=512) "strongly agree" and "agree" and 20.25% of them (f=130) is "disagree" and "strongly disagree". For the second sub-section, the effect on skills (4 items with 428 answers), 82.95% of the answers (f=355) consist of "agree" and "strongly agree" and 17.06% of them (f=73) consists of "disagree" and "strongly disagree". In the third sub-section which is "effect on sub-skills 3 items with 321 answers, 84.43% of the answers (f=271) are "agree" and "strongly agree" but 15.57% of them are (f=50) "disagree" and "strongly disagree". Final sub-sections is "future implications (2 items with 214 answers)", there is 75.7% of total answers (f=162) consisting of "agree" and "strongly agree" also there is 24.3% of total answers (f=52) consisting of "disagree" and "strongly disagree".

Table 3. Correlation of each sub-sections

	Positive attitudes	Effects on skills	Effects on subskills	Future implications
Positive attitudes				
Effects on skills	.78**			
Effects on subskills	.78**	.85**		
Future implications	.88**	.78**	.77**	
Mean	11.55	7.64	5.58	4.05
Sd	4.04	2.59	2.02	1.60

**. Correlation is significant at the 0.01 level (2-tailed).

In this table, the correlation of each sub-sections can be seen. According to one of the parametric statistical procedures named Pearson Correlation results, the correlation levels indicating the mean values of each teaching style section of the inventory fit into the significance at the 0.01 level. More interestingly, at the significance level of 0.01, the table informs that each teaching style has a high positive correlation with one another in different degrees.

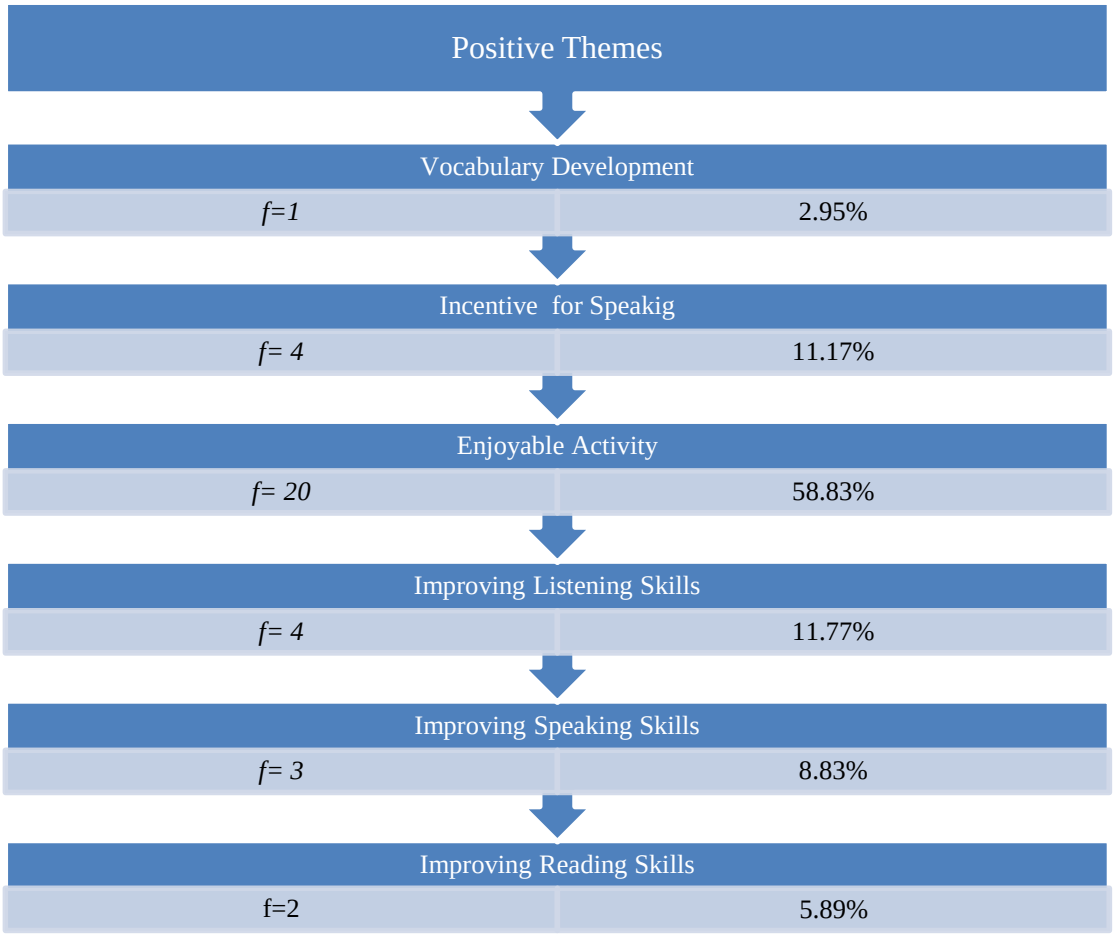

Figure 1. The positive aspect of Web2.0 tools and social media applications in the language learning process

During the interview, some positive themes have been written down based on students' answers. 2.95% of students (f=1) mentioned "vocabulary development", 11.77% of them (f=4) talked about "incentive for speaking", 58.83% of students expressed their ideas by saying "enjoyable activity", 11.77% of participants (f=4) mentioned "improving listening activity", 8.83% of them (f=3) talked about "improving speaking skills" and 5.89% of students (f=2) wanted to express their feelings by using "improving reading skills".

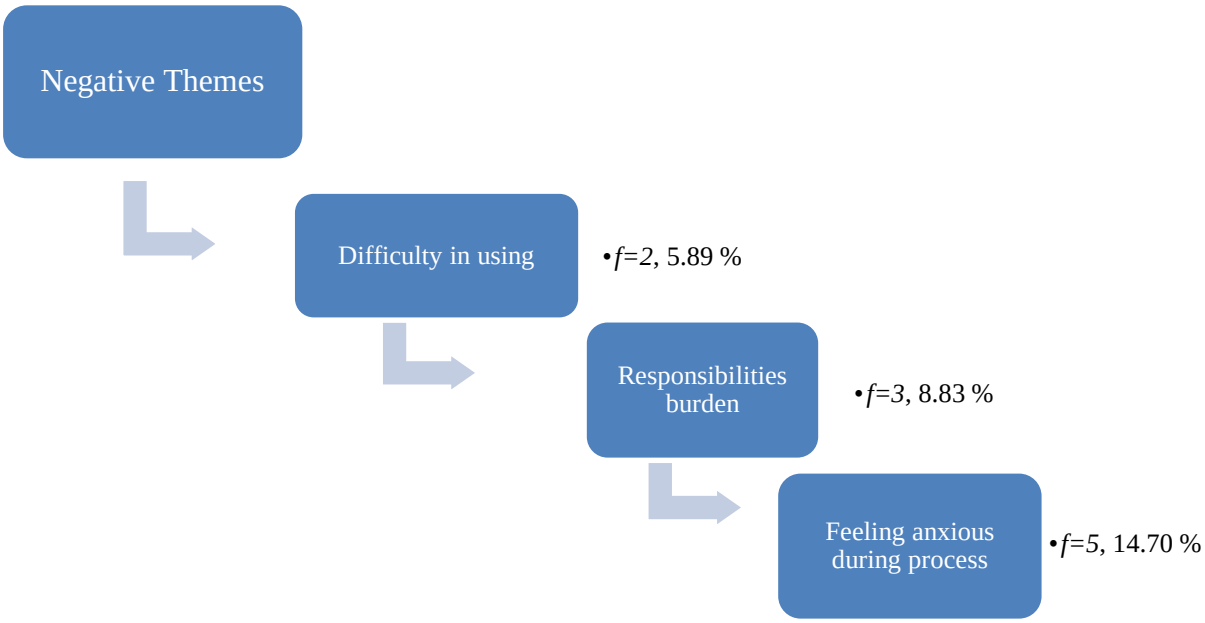

Figure 2. The negative aspects of Web 2.0 tools and social media applications in the language learning process

As it can be observed in the figure above, 5.89% of the students (f=2) mentioned "difficulty in using", 8.83% of them (f=3) talked about "responsibilities burden" and 14.70% of students (f=5) expressed their opinions by saying "feeling anxious during the process".

Table 4. Kruskal Wallis H test results for total scores of scale in terms of how the learners feel when the teachers use Web 2.0 and social media tools for English learning

How do you feel…	**N**	**Mean Rank**	**Sd**	**X^2**	**p**	**Significant Difference**
I become unhappy	8	85.25	**3**	**30.470**	**.000**	**Unhappy-Neutral,**
I become neutral	29	71.60				**Unhappy-Excited,**
I get excited	33	51.33				**Unhappy-Very excited,**
I get very excited	37	35.82				**Neutral-Excited,**
						Neutral-Very excited,
Total	107					**Excited-very excited**

After the analysis of Kruskal Wallis H test results, it can be observed that scale scores of students, in terms of "how do you feel…?" question are very different. As in; X^2 (Sd=3, n=8, n=29, n=33; n=37) =85.25; 71.60; 51.33; 35.82, $p<.05$. When the group ranks are taken into consideration, the highest scores, students had, can be ordered like this; unhappy, neutral, excited, and very excited.

Table 5. Categorized descriptive statistics of semi-structured interview applied to 34 students who experienced Web 2.0 tools and social media applications

Questions	Categories	f	%
What do you think of Web 2.0 tools and social media applications?	Vocabulary Development	1	2,9
	Incentive for Speaking	4	11.8
	Enjoyable Activity	20	58.8
	Improving Listening Skills	4	11.8
	Improving Speaking Skills	3	8.8
	Improving Reading Skills	2	5.9
	Total	34	100
What differences do you see in terms of English learning?	Vocabulary Development	7	20.6
	Improving Listening Skills	14	41.2
	Improving Speaking Skills	9	26.5
	Improving Reading Skills	4	11.8
	Total	34	100

Do you have any problems using them?	Difficulty in Using	2	5.9
	Responsibilities Burden	3	8.8
	Feeling Anxious During the Process	5	14.7
	No	24	70.6
	Total	34	100
How do you feel while using them?	Normal	8	23.5
	Excited	10	29.4
	Very Motivated	16	47.1
	Total	34	100
Do Web 2.0 tools and social media applications contribute to you?	Yes	34	100
	No	0	0
	Total	34	100
Do you recommend them to others?	Yes	34	100
	No	0	0
	Total	34	100

In this table, categorized descriptive statistics of semi-structured interview results can be observed. 6 questions were directed to 34 different students who were experienced in using Web2.0 and social media applications in their English language learning process. For the first question of "What do you think of Web 2.0 tools and social media applications?", 2.9% of them (f=1) mentioned "vocabulary development", 11.8% (f=4) mentioned "incentive for speaking", 58.8% (f=20) mentioned "enjoyable activity", 11.8% (f=4) mentioned "improving listening skills", 8.8% (f=3) mentioned "improving speaking skills", 5.9% (f=2) mentioned "improving reading skills". The second question was "What differences do you see in terms of English learning?" and 20.6% of them (f=7) talked about "vocabulary development", 41.2% (f=14) talked about "improving listening skills", 26.5% (f=9) talked about "improving speaking skills". 11.8% (f=4) talked about "improving reading skills". The next question was about their problem while using them, "Do you have any problems in using them?", and 5.9% of them (f=2) agreed with "difficulty in using", 8.8% (f=3) agreed with "responsibilities burden", 14.7% (f=5) agreed with "feeling anxious during the process", 70.6% (f=24) agreed with "no". The next question was about their feelings, "How do you feel while using them?" 23.5% of them (f=8) said "normal", 29.4% (f=10) said excited, 47.1% (f=16) said "very motivated. Next question was about to test these tools' contribution to learners, "Do Web 2.0 tools and social media applications contribute to you?" and 100% of them went with "yes". Final question of the interview was to learn about their recommendation, "Do you recommend them to others?" and 100% of the students replied as "yes".

DISCUSSION

This section displays comments on the findings of the current study. Thus, starting with the descriptive statistics of students' points of view on Web 2.0 and social tools, it can be concluded that the students are aware of the positive sides of these computer-mediated or instructional technologies while learning the English as a foreign language and may supportive inclination to receive the contents of their courses in these ways. Based upon the studies in the review of literature, the findings referring the views of the participants under the scope of his current study could be associated with many studies. As Tılfarlıoğlu (2011) said, "even if few studies are exploring the practices of Web 2.0 tools in foreign language education, there is almost no study focusing on students' perceptions upon the use of Web 2.0 tools in foreign language learning, though". This research can be one of the studies focusing on students' perceptions. Having looked at the students' points of view on Web 2.0 tools, it can be seen that most of the students are capable of using Web 2.0 and social media applications. As Aşıksoy (2018) mentioned, "Web 2.0 tools not only provide a natural environment and cooperation in language learning, but they also help to teach in a way that students can control their learning". Also, most of the students believe that they can learn

English with Web 2.0 and social media applications these tools have a positive impact on their learning. According to Behjat, Bagheri, and Yamini (2012), to ensure that learners can control their language learning process, Web 1.0, Web 2.0, and newly developed Web 3.0 tools continue to produce more tools. In terms of being enjoyable, most of them prefer using Web 2.0 and social media tools. Improving reading, writing, speaking, and vocabulary, Web 2.0 tools, and social media applications is another preference by the majority of students. From the students' points of view on Web 2.0 tools, it can be seen that most of the students would like to carry on their foreign language education with Web 2.0 tools and social media applications.

Analyzing the descriptive statistics of sub-sections, the findings display students feeling positive attitudes and effective skills based on Web 2.0 tools and social media applications. In terms of students' feelings when their teacher uses Web 2.0 tools and social media applications, it was reflected that the majority of them feel happy and motivated. According to Bustamante, Hurlbut, and Moeller (2012) thanks to technology, teachers can access a learning environment in which their learners feel relaxed and motivated, this authentic learning environment later results in effective learning.

In Table 8, categorized results of semi-structured interviews show that most of the students see the improvement in terms of vocabulary, listening, and reading skills and their approach to Web 2.0 tools and social media applications is an "enjoyable activity". In Table 8, it is obvious that nearly all of the students do not have difficulty in using them and they think that Web 2.0 tools and social media applications contribute to themselves. Also, in Table 8, the vast majority of students express their feelings using the phrase "I would like to recommend Web 2.0 tools and social media applications in language learning to others". As Eren (2015) stated "As Web 2.0 tools allow users to create and share information and media on a global scale, students are no longer passive recipients of knowledge. Rather, they are active participants that create content by remixing original materials."

Benefiting from Web 2.0 tools and social media applications in foreign language learning has positive impacts on both learners and teachers. As Kayri and Çakır (2010) mentioned, Web 2.0 tools and some social networking sites can be used for pedagogical purposes as integrating lessons with Web 2.0 tools help to increase group and individual works. Creating a positive learning environment is helpful for both teachers and learners. Helping learners to gain self-learning skills is vital in the educational life of learners. The most commonly benefited reports for learners are increasing their writing competence and improving their writing strategies. (Armstrong & Retterer, 2008; Arnold, Ducate, & Kost 2009; Ducate & Lomicka, 2008; Kessler, 2009; Lee, 2010; Mark & Coniam, 2008; Raith, 2009; Zorko, 2009). According to Wang and Vásquez (2012), Web 2.0 technologies-supported classrooms help learners to broaden the scope of CALL research. This broadening of learners is also helpful for teachers to utilize their lessons according to their learners' needs.

CONCLUSION

This current research aims to investigate students' feelings and knowledge about foreign language learning by interrelating the process with Web2.0 tools and social networking sites used for educational purposes. Analyzing the results collected from students will highlight the way of teaching a foreign language for teachers. To be able to teach a foreign language, learners need to be alerted and motivated, so this research aims to find out the best way of including them in the teaching and learning process. The effects of using Web 2.0 tools and social media applications were illustrated clearly and the findings of the current study were interrelated with the target literature as discussed above.

As an accepted fact, the best way to learn a language is to live with it. In 2020, living with a language is very possible for digital learners as Web 2.0 tools and social media applications surround all of them to provide opportunities for learning and teaching. For language teachers, introducing the learners to these tools and integrating them into diverse lessons will help them to live with the target language every day and minute. Using them even as icebreakers have a great impact on their motivation in a way that making these Web 2.0 tools and social media applications a main part of teaching will increase their learning.

As for the limitations, the interview process was conducted via Skype or Google Hangout applications because of the Covid-19 outbreak. Face-to-face interviews could have revealed more authentic responses from learners. Another limitation was the only involvement of high school students in the study. In further studies, the participation of elementary and primary school students with a larger population could be another subject of research. Also, non-experienced students could be asked to participate in this research to be to analyze and compare results for experienced users and non-experienced students. At the same time, the similar applications can be carried out by designing experimental research designs in which the language learners who are unaware of or unable to receive education with instructional technologies that establish the focus group while the experienced participants may be among the control group to unveil the widespread effects of technologies on language learning

and teaching. Last but not the least, as technology changes at any time, new tools and techniques combined with other variables of English language teachers, or parents providing scaffolding for the learners during the distance education period of this outbreak could also be implemented into the upcoming research.

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The Effect of Different Cooperative Learning Methods on Laboratory Activities of Science Teacher Candidates

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ABSTRACT
The study aimed to determine the effects of students teams achievement divisions (STAD) and reading-writing-application (RWA) methods on teacher candidates' academic achievements, laboratory attitudes, cooperative work, laboratory safety and scientific process skills in science teaching laboratory practice-I courses. In the research, a quasi-experimental design with pretest-posttest comparison groups was used. The research was conducted with 36 third grade teacher candidates who are studying as science teachers in the fall semester of the 2018-2019 academic year. The data were collected with the academic achievement test and science laboratory attitude scale and observation. In the analysis of the data, descriptive statistics, independent groups t-test, dependent groups t-test were used. Besides, it was determined that there was no statistically significant difference between the academic achievements and laboratory attitudes of the teacher candidates who applied the RWA and the STAD methods. According to the observation results, it was determined that there was no statistically significant difference between the cooperative work of the teacher candidates who applied the RWA and the STAD methods. Also, the results indicated that there was a statistically significant difference between laboratory safety and basic and causal skills of teacher candidates in terms of the RWA method.
Keywords: Science Laboratory Applications, Academic Success, Attitude, Scientific Process Skills, Students Teams Achievement Divisions, Reading-Writing - Application

INTRODUCTION
Science helps us understand and evaluate the Earth and Universe in which we live (Şimşek, Doymuş & Şimşek, 2008). Thus, science and science education is important (Gürses, Doğan, Yalçın & Canpolat, 2002) and it is thought that the existence of science and technology would not be possible without science education. According to this point of view, nature is an untouched laboratory for science that operates with a very wide scope and in a great system. It is necessary to show students that they are a part of the events that take place in this unlimited natural laboratory, to teach the basic science concepts that they can use to explain these events, and to make them love science in order to make them individuals who can think and understand science (Güneş, Şener, Termi & Can, 2013). However, it is not possible to always work in a laboratory of nature, that's why it is of great importance to establish artificial laboratories in school environments to teach science education students (Kırbaşlar, Güneş & Deringöl, 2008). It includes various levels of activities performed in laboratories by using certain materials which range from simple demonstration experiments to complex science experiments (Demir, Böyük & Koç, 2011). The purpose of these experiments is to serve that students learn in a meaningful way by researching, analyzing, and passing the information through mental filters, rather than directly conveying information. Suitable laboratory activities are effective in the development of research, solving a problem and reasoning skills (Uluçınar, 2004). Cooperative learning models including many different methods and techniques will improve the skills of teacher candidates and are useful for both educators and researchers. For example, students improve scientific process skills including observing, inferring, measuring, predicting, interpreting data, formulating hypotheses, creating definitions operationally, determining variables (Bilgin & Toksoy, 2007; Bozdoğan, Taşdemir & Demirbaş, 2006). Cooperative learning model has important features such as positive commitment, individual responsibility, rewards (Slavin, 1983), the formation of groups and group spirit, the role of the teacher, the use of social skills, face-to-face interaction, and group rewards (Bayrakçeken, Doymuş & Doğan, 2013; Johnson & Johnson, 1994). Reading-Writing-Application (RWA) is a kind of cooperative learning model. Before applying the RWA, teams are created that consist of four to six students who are in harmony according to their academic performance, gender, and ethnicity.

The RWA also improves reading, writing, and practicing skills by working individually and in groups. Teams created read different sources, discuss and report what they read with their group without using sources, and then present their work to others teams. This situation improves their skills (Aksoy, 2011; Şahin, 2013). The RWA helps to improve their achievement, as well (Akçay, 2012; Akçay & Doymuş, 2014; Akçay, Doymuş, Şimşek & Okumuş, 2012; Aksoy, 2013; Koç, 2014; Koç, Şimşek & Fırat, 2013; Okumuş, 2014; Şahin, 2013; Şimşek, 2012, 2013; Şimşek, Yılar & Küçük, 2013). Another method is Student Teams-Achievement Divisions (STAD) including six main steps. In the same way, the RWA method, heterogeneous groups of students are formed. Certain topics are given to the groups to learn. Then, the teacher determines which group or groups will present. After completing their work, worksheets are given to each student. Students are ranked according to their average scores. Group success is found by gathering individual achievements and the most successful group deserves rewards (Bayrakçeken, Doymuş, Doğan, 2013). Additionally, itwas concluded that the STAD method helps to improve students' achievements and ensures the integrity of the concepts (Gelici & Bilgin, 2011; Bilgin, 2004; Küçükilhan, 2014; Ocak, Küçükilhan,2015; Ural, Umay & Argün, 2008). Therefore, effective learning environments can be created for teacher candidates who will receive teacher education and these environments will help them achieve these gains. As a result of a comparison of the RWA and the STAD methods, it was determined that the STAD method was much more effective in student success (Alyar & Doymuş, 2015; Doymuş, 2017; Koç, 2014; Koç & Şimşek, 2016; Öztürk & Doymuş, 2018). Generally, studies which compare these two methods examined the effects of these methods on students' academic achievement. When the literature was examined, these methods were found to be effective for academic development of students, but it was determined that there were a limited number of studies to compare the effects of the two methods. This study aimed to determine the effects of these methods on teacher candidates and their academic achievements, laboratory attitudes, cooperative work, laboratory safety and scientific process skills. The main problem of this study: Which one of the methods of the STAD and the RWA are more effective for academic achievement, positive laboratory attitudes, collaborative work, laboratory safety, and scientific process skills of science teacher candidates? The sub research questions of this study:

1. Is there a significant mean difference between the effects of the STAD and the RWA methods on teacher candidates' academic achievements?
2. Which one of the methods of the STAD and the RWA are more effective on the science teacher candidates' academic achievements?
3. Is there a significant mean difference between the effects of the STAD and the RWA methods on teacher candidates' attitudes?
4. Is there a significant mean difference between the effects of the STAD and the RWA methods on collaborative work, laboratory safety, and scientific process skills of science teacher candidates?

METHOD

In the research, a quasi-experimental design with pretest-posttest comparison groups was used. Quasi-experimental designs are those in which individuals in the research group are not assigned to groups randomly or in which all variables cannot be fully controlled (Mcmillan & Schumacher, 2006). Since the effect of the RWA and the STAD methods on academic achievement, laboratory attitude, cooperative work, laboratory safety, and scientific process skills was investigated, the method of pretest-posttest comparison groups was preferred. The experimental plan of the research is given in Figure 1.

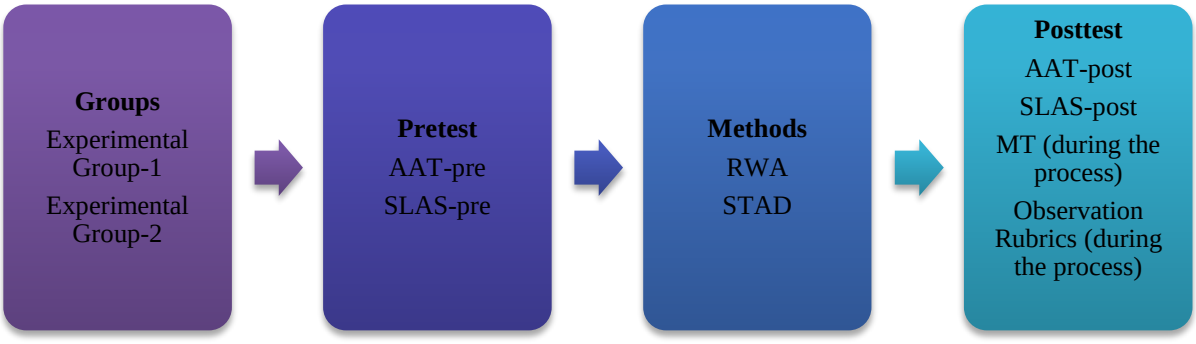

Figure 1: Experimental plan of the research

As seen in Figure 1, at the beginning of the application, the academic achievement test (AAT-pre) and the science laboratory attitude scale (SLAS-pre) were applied as pretests. During the process, the RWA methods were applied to the group which is Experimental Group-1 and the STAD methods in the group which is Experimental Group-2. After application, the academic achievement test (AAT-post) and the science laboratory attitude scale (SLAS-

post) was applied as a posttest. A module test (MT) was applied, and observation data were collected all groups every week during the whole process from the first experiment to the last experiment.

Study Group

The research was conducted with 36 third grade teacher candidates who are studying to become science teachers in the fall semester of the 2018-2019 academic year. The random assignment method was used to include teacher candidates in the study group. The names of the teacher candidates were written on papers of the same color and size, folded and put in an invisible bag. Two groups were randomly formed as a Group-1 and Group-2. There was randomly chosen a name from the bag for each group in turn. Then, there was put in the bag again each name chosen and the probability of teacher candidates being selected for the groups was equalized. Before if the name selected appeared, it was folded back into the bag and continued until a new name was released. When all the names were completed, the names of the groups were written on the papers and put in a bag, and a lottery was chosen to determine which one would be Experiment Group-1 and Experiment Group-2. After the experimental groups were formed, the teacher candidates were informed about the process and a volunteer form was signed by each teacher to participate in the study. 6 pre-service teachers who did not want to participate in the research in both groups were excluded from the study groups. As a result, 18 teacher candidates took part in the study group in both experimental groups.

Data Collection Tools

Academic Achievement Test

The achievement test used in this study was developed by the researchers. The test is a two-step test consisting of multiple-choice and open-ended questions. Since there are no certain objectives at the university level, firstly, the subject scope of the experiments and the experiments were determined for groups. Two or three questions related to each topic were written using the indicator table. The test includes questions about the theoretical knowledge, construction, results, and security measures of the experiments. The questions prepared were presented to a group of six people who are experts in physics, chemistry, and biology, and assessment-evaluation. These experts examined the test from many angles, especially the features that it measured, the topic scope, the understandability of the questions, the roots of question, and options, the answer key, the scoring, and formal features. As a result, according to these expert opinions, it was determined that the test exactly provided the topic scope and all the questions were aimed at measuring the same features.Three questions required other knowledge and skills could not be corrected, so they were removed from the test, and two questions were edited. Similarly, according to these expert opinions, the scoring of the answer key was adjusted, as well. After the questions and arrangements were completed, the test was made ready for a pilot application. The pilot application was conducted with 96 senior science teacher candidates who had taken the Science Laboratory Applications course in the previous year. As a result of the analysis of the data obtained from the pilot applications, the KR-20 reliability coefficient for the multiple-choice questions of the test was calculated as 0.86. The average item difficulty index of the test was found to be 0.48 and item difficulty indices ranged from 0.23 to 0.86. The discrimination index of the questions ranged from 0.35 to 0.77. Open-ended questions were carried out by two researchers independently and the Kappa coefficient was found to be 0.82. As a result, the test consisted of two stages: 27 multiple-choice and 8 open-ended questions. Multiple choice questions are scored with 1 point for a correct answer and 0 points for an incorrect or blank answer. The detailed scoring key was used in the evaluation of open-ended questions. The minimum score that could be taken from the test was 0 and the maximum score was 100.

Module Tests

Module tests (MT) which relate to the topic of the experiment were applied every week. These tests were applied at the end of the writing phase of the RWA method. Also, that tests about theoretical knowledge, and the construction and security measures of the experiments were applied after that completed experiment in the STAD method. The questions and answer key of the MTs were prepared at the beginning of the application and presented to the opinions of experts who have a field of physics, chemistry, and biology. Each MT consisted of 3 open-ended questions. All tests were evaluated independently by two different researchers based on the answer keys. The agreement between the researchers' scores was calculated with the Kappa coefficient. Kappa coefficients vary between 0.76 and 0.84. The minimum score that could be obtained from the tests was 0 and the maximum score was 30. After all tests were evaluated, the averages of 11 tests were taken, and the scores were analyzed by converting them into a hundred points system due to the application of a hundred-point grading system.

Science Laboratory Attitude Scale

In the study, the Attitude Scale towards Science Laboratory developed by Yamak, Kavak, Canbazoğlu Bilici, Bozkurt and Peder (2012) was used. The scale consists of 23 items that have 15 positive and 8 negative items. For pilot applications of the scale were studied with 236 teacher candidates. Additionally, the validity studies of the scale were also used exploratory and confirmatory factor analysis. As the exploratory factor analysis was

determined that the scale consists of three factors which are the importance of the laboratory, the laboratory lesson and the use of equipment and laboratory documents. It was found that the model emerged as a result of the confirmatory factor analysis was highly compatible with the data. The Cronbach Alpha reliability coefficient of the scale was calculated as 0.88. For this study, confirmatory factor analysis was used in the validity analysis and it was determined that the goodness of fit indexes was within the desired range. In the reliability analysis, the internal consistency coefficient was calculated and the Cronbach Alpha value was found to be 0.91.

Observation Rubrics

Initially, for observation rubrics, the literature on cooperative learning, laboratory safety, and scientific process skills was investigated, and then critical behaviors were determined. While the sections on laboratory safety and scientific process skills consist of the same behaviors for both methods, the section related to cooperative learning has been prepared separately for the behaviors observed in both methods as well. The laboratory safety section consists of behaviors related to the basic safety precautions to be taken before, during and after the experiment. The scientific process skills section consists of basic skills and causal skill behaviors. After the behaviors to be observed were determined, they were presented to the opinions of 3 field experts working on cooperative learning and scientific process skills. The observation form consists of 19 behaviors for cooperative work, 13 for laboratory safety, 5 for basic skills, and 11 for causal skills. Behaviors were observed in five-point Likert type according to their realization degree. The observations were carried out continuously by two researchers independent of each other as a group observation. It was calculated as 0.77 with the coefficient of agreement between the observation data of the two researchers (Miles & Huberman, 1994).

Data Analysis

In the analysis of the data, the compatibility of the parametric tests with the assumptions was primarily examined. The values of the data regarding normality are given in Table 1.

Table 1: Normality values

Test	Group	Kurtosis	Skewness	Min	Max	Med	Mean	St. D	Shapiro-Wilk*
AAT-pre	RWA	0.211	-0.223	18.00	62.00	50.00	49.18	16.32	0.971
	STAD	-0.603	0.051	22.00	68.00	52.00	51.50	12.08	0.481
SLAS-pre	RWA	-0.154	-0.946	58.00	95.00	76.50	78.83	10.94	0.489
	STAD	0.424	-0.241	55.00	102.00	74.00	76.67	12.54	0.817
AAT-post	RWA	0.121	-0.878	58.00	98.00	77.50	76.81	13.54	0.252
	STAD	-0.333	0.087	46.00	96.00	74.38	74.60	12.34	0.237
SLAS-post	RWA	-0.509	-0.093	78.00	103.00	94.00	93.22	73.78	0.571
	STAD	-0.100	-0.810	73.00	108.00	91.00	90.94	69.11	0.661
MT	RWA	0.270	-0.841	59.00	92.00	73.00	73.78	10.95	0.183
	STAD	0.489	-0.626	53.00	93.00	69.00	69.11	11.94	0.291
Cooperative work	RWA	0.052	-0.961	70.00	88.00	77.50	78.50	6.32	.271
	STAD	-0.328	-0.505	61.00	84.00	76.00	77.83	10.84	.920
Laboratory Safety	RWA	-1.626	0.984	28.00	58.00	51.50	49.25	8.27	.061
	STAD	-0.319	-0.942	30.00	50.00	43.00	40.09	7.06	.257
Basic Skills	RWA	-0.028	-0.533	16.00	24.00	21.00	20.00	2.86	.119
	STAD	0.137	-0.517	11.00	22.00	17.00	15.91	3.33	.618

Causal Skills	RWA	0.643	-0.535	31.00	43.00	35.00	35.50	3.80	.288
	STAD	0.074	-0.863	25.00	36.00	31.00	30.45	3.47	.867

*p>.05

The values given in Table 1 show that the data are distributed normally. For this reason, independent groups t-test and dependent groups t-test were used. Effect size values were calculated in terms of eta-squared. The data were analyzed using the SPSS 20 program. In data analysis, the significance value was taken as 0.05.

Application

The experiments determined were completed in 11 weeks (22 lesson hours). However, the implementation duration was completed in total 13 weeks (26 lesson hours) with the application of pre-tests and post-tests. During the application, the researchers took the role of a guide and observer. Group studies were followed carefully, the groups were assisted when necessary, group discussions were initiated by asking questions, experimental setups were checked and additional information about the experiments was given. The experiments given in Figure 2 were carried out in 11 weeks.

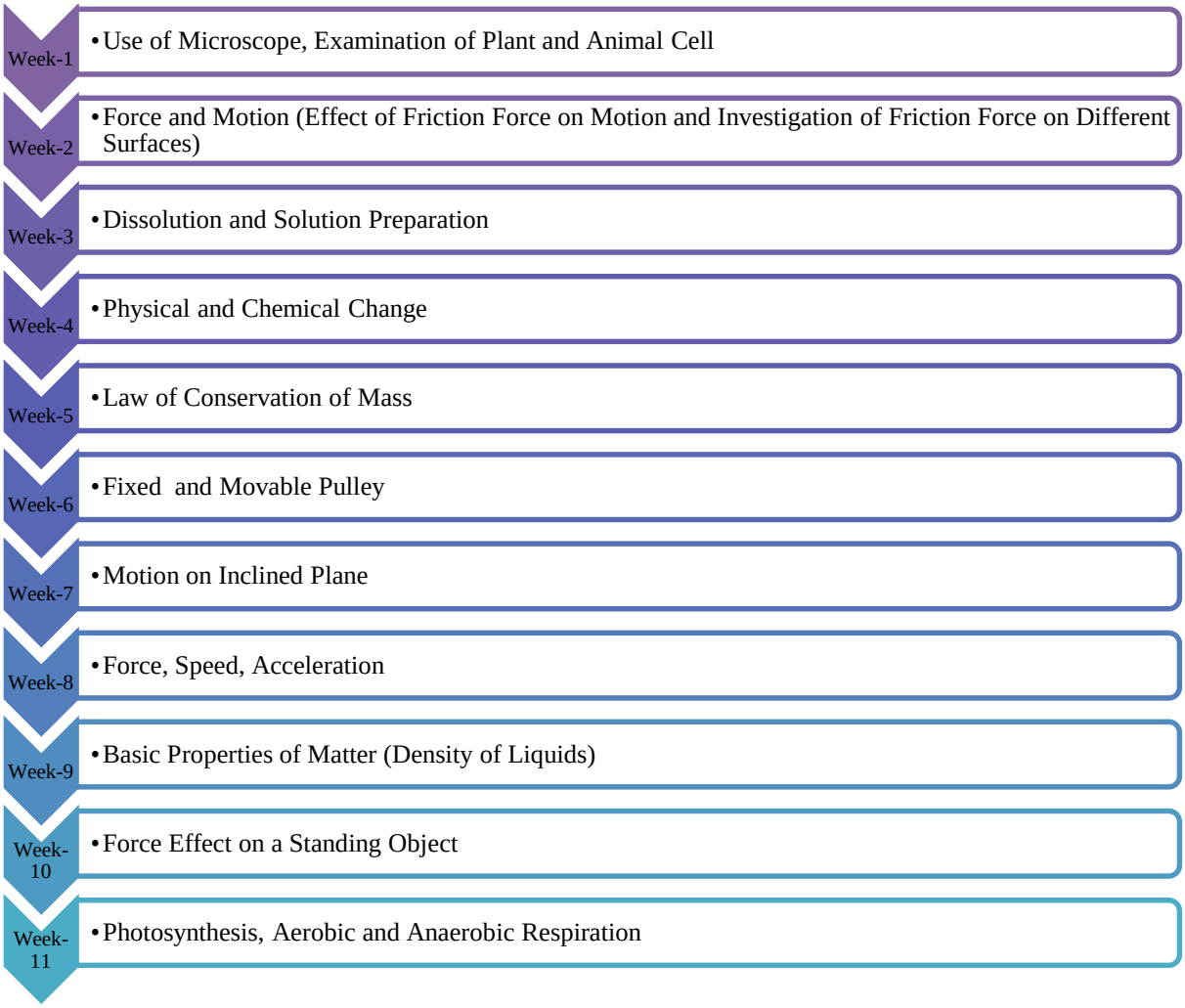

Figure 1: Experiments conducted during research

Application of the RWA Method

The six groups of three of teacher candidates were created taking into account the prior knowledge, gender and attitudes towards the laboratory of them, so that a heterogeneous structure within the group was formed. It was made sure that the structure between groups is homogeneous. After the groups were formed, the teacher candidates took their places on their experiment tables, and determined the group names and logos. It informed teacher candidates about the application and the method of how they apply. Laboratory safety rules are explained to ensure a safe working environment before, during, and after the experiment. Information describing the skills within the scientific method that are necessary to prepare, complete, and present an experiment were presented to students.

The teacher candidates did read sheets provided by the researchers, and additional resources which they brought to the laboratory about the experiment, so they would do each week for 20 minutes. After teacher candidates completed their reading, all sources were removed, the writing stage started, and then they wrote a report from the information they had in their mind. They prepared a report containing the theoretical knowledge, purpose and construction of the experiment with the information remembered from the reading phase nearly for 15 minutes. After the writing phase was completed, 15 minutes were allocated and the MT related to that week was applied. In the next 35 minutes of the lesson, the groups carried out their experiments and in the remaining 15 minutes, they completed their weekly work by making group discussions about the experiment. The reports prepared by the groups during the writing phase were evaluated weekly. Additional points ranging from 5-10 were given to the end-of-term scores as a reward based on their success in writing reports.

Application of the STAD Method

The teacher candidates were divided into groups of three in a way to create a heterogeneous structure within the group, taking into account their prior knowledge level, gender, and attitudes towards the laboratory. It was made sure that the structure between groups is homogeneous. After the groups were formed, the teacher candidates took their places on their experiment tables, and determined the group names and logos. It was explained about the application and method to groups. Additionally, it has been provided about information on basic laboratory safety. Teacher candidates were informed about scientific process skills how they can use and develop in experiments. The researchers shortly presented nearly for a 5-minute about the experiment each week. After the presentations, the groups worked together on the experiment for 15 minutes on how they will do. After the group work, they carried out their experiments together for 35 minutes and made group discussions in the next 15 minutes. The groups prepared their reports on the experiment in the remaining 15 minutes. In the last 15 minutes of the lesson, MT for that week was applied. Individual progress scores were recorded by comparing the scores of the teacher candidates from the weekly tests with the target scores formed by considering the pre-test scores applied at the beginning. Additional points were given to the teacher candidates as a reward in terms of their individual progress scores.

FINDINGS

Findings of the First Research Question

The dependent groups t-test analysis results, which were made to determine the effect of the RWA and the STAD methods on the academic achievements of teacher candidates, are given in Table 2.

Table 2: Dependent groups t-test results regarding the effects of the RWA and the STAD applications on academic achievement

Method	Measurement	N	M	Std. D.	df	t	p*
RWA	Pretest	18	49.18	16.32	17	-9.457	.000
	Posttest	18	76.81	13.54			
STAD	Pretest	18	51.50	12.08	17	-5.627	.000
	Posttest	18	74.60	12.34			

*p<.05

As can be seen from the analysis results given in Table 2, the academic achievements of the teacher candidates who were applied the RWA method ($t_{(17)}$=-9.457, p<.05, η^2=.84) and the STAD method ($t_{(17)}$=-5.627, p<.05, η^2=.65) increased statistically significantly. Eta-squared effect sizes were calculated as .84 for the RWA method and .65 for the STAD method, and these values were classified as very large effects by Cohen (1988). Accordingly, it can be said that the increase observed in the academic achievements of teacher candidates is 84% due to the RWA method and 65% from the STAD method.

Findings of the Second Research Question

The independent groups t-test analysis results, which were made to compare the effects of the methods on the academic achievement of teacher candidates, are given in Table 3.

Table 3: Independent samples t-test analysis results of AAT-pre and AAT-post data

Measurement	Method	N	M	Std. D.	df	t	p
Pretest	RWA	18	49.18	16.32	34	-.485	.631
	STAD	18	51.50	12.08			
Posttest	RWA	18	76.81	13.54	34	.511	.612
	STAD	18	74.60	12.34			

As can be seen from the analysis results given in Table 3, there is no statistically significant difference between teacher candidates' prior knowledge levels at the beginning of the application ($t_{(34)}$=-.485, p>.05). At the end of the application, it was determined that there is no statistically significant difference between the academic achievements of teacher candidates who were applied the RWA and the STAD methods ($t_{(34)}$=.511, p>.05).
Independent groups t-test analysis results of the data obtained from MTs applied weekly during the application are given in Table 4.

Table 4: Independent samples t-test analysis results of data obtained from MTs

Method	N	M	Std. D.	df	T	p
RWA	18	73.78	10.95	34	1.222	.230
STAD	18	69.11	11.94			

According to the analysis results given in Table 4, there is no statistically significant difference between the achievement of the teacher candidates in the experimental subjects ($t_{(34)}$=1.222, p>.05).

Findings of the Third Research Question
The dependent groups t-test analysis results made in order to determine the effect of the RWA and the STAD methods on the attitudes of teacher candidates towards science laboratories are given in Table 5.

Table 5: Dependent groups t-test results regarding the effect of the RWA and the STAD applications on science laboratory attitudes

Method	Measurement	N	M	Std. D.	Df	t	p
RWA	Pretest	18	78.83	10.94	34	.552	.584
	Posttest	18	76.67	12.54			
STAD	Pretest	18	93.22	73.78	34	.750	.458
	Posttest	18	90.94	69.11			

As can be seen from the analysis results given in Table 5, the laboratory attitudes of the pre-service teachers who were applied the RWA method ($t_{(17)}$=-4.819, p<.05, η^2=.58) and the STAD method ($t_{(17)}$=-5.517, p<.05, η^2=.64) statistically significantly increased. Eta-squared effect sizes were calculated as .58 for the RWA method and as .64 for the STAD method, and these values were classified as very large effects by Cohen (1988). Accordingly, it can be said that the increase observed in teacher candidates' laboratory attitudes is due to 58% the RWA method and 64% the STAD method.

Findings of the Fourth Research Question
Independent groups t-test analysis results made in order to compare the effects of the methods on teacher candidates' laboratory attitudes are given in Table 6.

Table 6: Independent samples t-test analysis results of SLAS-pre and SLAS-post data

Measurement	Method	N	M	Std. D.	Df	t	p
Pretest	RWA	18	78.83	10.94	34	.552	.584
	STAD	18	76.67	12.54			
Posttest	RWA	18	93.22	73.78	34	.750	.458
	STAD	18	90.94	69.11			

As can be seen from the analysis results given in Table 6, there is no statistically significant difference between teacher candidates' attitude levels in the science laboratory at the beginning of the application; ($t_{(34)}$=-.55, p>.05). At the end of the application, it was determined that there was no statistically significant difference between the attitude levels of pre-service teachers who were applied the RWA and the STAD methods ($t_{(34)}$=.750, p>.05).

Findings of the Fifth Research Question

Independent groups t-test analysis results of the data obtained from the observations made during the application are given in Table 7.

Table 7: Independent groups t-test results of observation data

Measurement	Method	N	M	Std. D.	Df	t	p
Cooperative Working	RWA	66	78.50	6.32	64	.184	.856
	STAD	66	77.83	10.84			
Laboratory Safety	RWA	66	49.25	8.27	64	2.843	.010*
	STAD	66	40.09	7.06			
Basic Skills	RWA	66	20.00	2.86	64	3.168	.005*
	STAD	66	15.91	3.33			
Causal Skills	RWA	66	35.50	3.80	64	3.312	.003*
	STAD	66	30.45	3.47			

*p<.05

According to the analysis results given in Table 7, there is no statistically significant difference between the cooperative working behaviors of the teacher candidates who are applied the RWA and the STAD methods; ($t_{(64)}$=2.843, p>.05). It is seen that there is a significant difference in favor of the pre-service teachers who applied the RWA method between the safety working situations ($t_{(64)}$=-2.843, p<.05, η^2=.11), basic ($t_{(64)}$=-3.168, p<.05, η^2=.14), and causal ($t_{(17)}$=-3.312, p<.05, η^2=.15) scientific process skills of the teacher candidates. Eta-square effect size values; it is classified as a medium effect found to be .11 for laboratory safety, .14 for basic skills and .15 for causal skills and classified as large effect (Cohen, 1988). Accordingly, it can be said that 11% of the variability in laboratory safety behaviors of teacher candidates, 14% of the variability in basic skills and 15% of the variability in causal skills can be attributed to the methods applied.

CONCLUSIONS

The results indicated a significant effect of the STAD and the RWA methods on the academic achievement of science teacher candidates. This result is parallel to the studies of Alyar & Doymuş (2015). However, it can be said that the increase observed in the academic achievement of teacher candidates is 84% due to the RWA method and 65% to the STAD method. This result is similar to the result that the RWA method reached by Koç (2014) is more effective on achievement than the STAD method. In the RWA method, it can be said that the achievement of the teacher candidates increased for some reasons, why they reported what they have read with their group about the experiment (without using sources), benefited from each other's knowledge and experiences throughout the process, and supported each other in their learning (Slavin, 1994, 1995; Stevens, Madden, Slavin & Farnish, 1987).

Also in the STAD method, it can be said that achievement has increased due to teacher candidates working together, discussing on topics, supporting each other in their learning, and achieving the success of the groups they belong to according to their individual progress level. This result obtained from this study is similar to the result that the STAD method is effective on student achievement reached by Küçükilhan (2013), Akar and Doymuş (2015). It was determined that there was no statistically significant difference between the academic achievements of teacher candidates who applied the RWA and the STAD methods. This result is similar to the study reached by Koç and Şimşek, (2016). Although there are some practical differences between cooperative learning methods, all the cooperative learning methods based on fundamental principles, such as, individual responsibility, positive interdependence, individual or group assessment, group work with the guidance of positive structure, and face-to-face interaction among students and these are the methods in which the learner is active in the process and learns through their own life and experiences (Açıkgöz, 1992; Johnson & Johnson, 2014; Slavin, 1983).

The results indicated a significant effect of the STAD and the RWA methods on the science teacher candidates' laboratory attitudes. However, it can be said that the increase observed in the laboratory attitudes of teacher candidates is 58% due to the RWA method and 64% to the STAD method. Also, the results indicated that there was no statistically significant difference between the laboratory attitudes of teacher candidates who applied the RWA and the STAD methods. It can be said that the attitudes of teacher candidates have increased thanks to working together, supporting each other in their learning, positive interdependence between group members, and achieving the success of the groups they belong to according to their individual progress level in both methods (Açıkgöz, 1992; Johnson & Johnson, 2014; Slavin, 1983; Stevens, Madden, Slavin & Farnish, 1987; Slavin, 1994, 1995).

Moreover, it was determined that there was no statistically significant difference between the cooperative work of teacher candidates. Based on this result, it can be said that teacher candidates in two groups acted in accordance with the nature of cooperative learning. The results indicated that there was a statistically significant difference between laboratory safety and basic and causal skills of teacher candidates in terms of the RWA method. This result obtained from this study is similar to the result reached by Aksoy and Doymuş, (2011), and Bilgin and Toksoy, (2007). In general, it can be said that the cooperative learning model has a positive effect on scientific process skills of teacher candidates (Ülük, 2019).

The RWA and the STAD methods can be used to increase academic achievement. Using the RWA and the STAD methods in classrooms with low motivation can be beneficial in increasing the motivation of teacher candidates. Similar applications can be carried out for longer periods and their effects on success and motivation can be examined. The RWA method can be used to increase teacher candidates' safe working behaviors in the laboratory. The RWA method can be used to increase teacher candidates' basic and causal scientific process skills. Teacher candidates should be informed about the essential elements of cooperative learning, such as, positive commitment, acting together in every situation, winning or losing together, and the process should be controlled so that situations that may harm the cooperative learning do not occur during the process.

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The Effect of Different Blending Levels of Traditional and E-Learning Delivery on Academic Achievement and Students' Attitudes towards Blended Learning at Sultan Qaboos University

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ABSTRACT
This research aims to design three educational programmes based on blended learning delivery to students attending the "introduction to educational technology" course. Each programme differs in its blending proportion between traditional and e-learning. The objective is to determine the most suitable blending ratio between the two delivery formats for this course, and compare the effectiveness of the three blending levels to the traditional instruction in terms of developing students' academic achievement and their attitudes towards using blended learning at the College of Education, Sultan Qaboos University. The results show a statistically significant difference at the level of <0.05 between the mean scores of all the experimental groups and the three control groups in the post academic achievement test, in favour of the experimental groups. The research recommends using a blended learning strategy with all blending ratios in teaching and developing different learning variables, such as understanding and thinking.
Keywords: blended learning, ratios, e-learning, achievement, attitudes, Oman

INTRODUCTION
Higher Education Institutions (HEIs) face several demands imposed by the ever-growing scientific and technological developments. They have to face the increasing turnout on higher education and improve their level of efficiency, effectiveness, and quality in line with era demands. They also need to develop human resources to meet the market and the development plan requirements. Therefore, radical changes in the university education system have to be made so that education is not limited to traditional teaching styles, but rather relies on modern ICT patterns, while remaining flexible and efficient. This can be easily accomplished by allowing instructional materials and curricula to reach higher education (HE) students at anytime and anywhere, giving them the competences, skills, and knowledge necessary for success in their careers and social lives.

Many HEIs in different countries use a mixture of learning delivery based on combining traditional and e-learning delivery formats, which many studies have proven effective in developing students' knowledge and skills (Akkoyunlu and Soylu, 2008; Ibrahim, 2007; Vaughan, 2007; Allam, 2008; So, and Brush, 2008; Morsi, 2008; Ali, 2009; Ghanem, 2009; Al-Qabbani, 2010). Drysdale et al. (2013) reveal that more unique blended learning (BL) contributions are needed. Other studies suggest that BL can solve traditional learning and e-learning problems, especially if internet technology developments are considered (Halverson et al., 2017; Cassidy et al., 2014).

BL has been recommended by researchers at various conferences, such as the 12th Scientific Conference of the Egyptian Association of Education Technology (2009), and the 4th International Conference of the Omani Society of Education Technology (2017), emphasising the need to adopt BL as one of the HE e-learning patterns. In addition, experiencing BL in HE worldwide has proven successful. For example, the Malaysian Open University has adopted e-learning, considering it essential to raise the learning quality, and at the same time, meet different students' needs (Ali, 2008). Additionally, universities, such as Harvard in the US and Cambridge in the UK, provide various BL models in different disciplines.

LITERATURE REVIEW
The type and nature of blending elements have resulted in numerous BL definitions. For example, Shaheen (2008) and Ammar (2010) state that BL mixes the Internet with traditional education. Other researchers perceive BL as a blend of all e-learning forms (computer or Internet-based) and traditional education, stressing that it is not limited

to only one, but both delivery types (Bonk and Graham, 2005; Draffan and Rainger, 2006). A third category of researchers define BL as a blend of the attributes and advantages of both traditional and e-learning in an integrated and structured form (Motteram, 2006; Akkoyunlu and Soylu, 2008). Al Musawi (2011) notes that BL enables teachers to use various forms to provide educational materials that enhance students' learning.

Abdel-khaleq (2010), Soman (2010), Al-Ghamdi (2011) and Faragon (2012) conducted quasi-experimental studies to measure the effect of BL on students' achievement in different subjects, and their attitudes towards it. They used educational materials, educational software, and an attitudinal scale towards BL as research tools. The studies consistently found a statistically significant difference between the mean scores of the control and experimental groups after the academic achievement test, in favour of the experimental group. The studies also show positive attitudes towards using BL as an instructional strategy. These studies are corroborated by Ahmed's (2011) study which explored the effect of using integrated learning in teaching chemistry on students' achievement and attitudes towards using it. An educational website, a student's guide, a teacher's guide, an achievement test, and an attitudinal scale were used as research tools. The study found statistically significant differences between the mean scores of the control and experimental groups after the academic achievement test at different levels (understanding, remembering, and application), in favour of the experimental. Moreover, it shows statistically significant differences between the mean scores of the experimental and control groups' attitudes towards BL, in favour of the experimental group. The study explains that BL takes into account learners' ability and pace of learning, leading to an increase in their interaction and assimilation of the subject content. Zhonggen and Yuexiu (2015) confirm existing shortcomings in both e-learning and traditional methods, and that educational institutions may devote their teaching methods towards a mixture of both approaches despite economic costs and other potential losses.

Reda's (2012) study shows the effectiveness of using a blended teaching strategy to solve environmental problems. Moreover, Tawfiq and Jaafar's (2017) study investigated the effectiveness of using combined learning in teaching a "home economics teaching methods" course for improving students' achievement and attitudes towards it in the College of Education, University of Najran, KSA. The results indicate the effective use of BL in the selected course on improving the experimental group's achievement and attitudes. Additionally, there is a positive correlation between female students' scores in the academic achievement test, and their scores on the BL attitudinal scale. Al-Qahtani (2018) examined the effect of teaching mathematics using BL on middle school students' achievement and development of critical thinking skills. The results reveal statistically significant differences between the mean scores of the experimental and control groups in the post achievement and critical thinking skills tests, in favour of the experimental. Sahni (2019) reports improved student learning in the group where BL was applied, in terms of achieving learning outcomes and comprehensive participation in online and class activities. She attributes this improvement to the students' motivation to learn, because they had some control over time, place, or speed of learning.

The above studies evince that BL improves students' achievement, interaction, participation, thinking, and attitudes towards learning; and helps develop communication skills. Therefore, it provides appropriate solutions for students and teachers to control the learning process flexibly and smoothly.

BLENDING RATIO

Authors note the scarcity of literature related to blending ratios. However, Graham (2006) defines four levels of BL, namely; activity, course, program and institutional blending levels, suggesting that blending ratios differs at each level. Allen et al. (2007) defines BL as a course in which the electronic content percentage ranges between (30%-79%). Alajab and Hussain (2015) assessed the impact of a proposed BL strategy for teaching the English language to health sciences students, and their motivation towards learning it. The mixing rate was about 60% for traditional mode, and 40% for e-learning, provided via the electronic system (Moodle®). The results reveal a significant impact of the proposed strategy on students' achievement and motivation to learn English. Furthermore, the experimental group report a high degree of satisfaction for experiencing BL in their English learning. Banyen et al. (2016) studied BL with a rate of 60% for e-learning and 40% for the traditional mode. They found that undergraduate students positively perceive BL because it adds changes to the learning method, making it more enjoyable and stimulating, because they can use technology outside the classroom. Owston and York (2018) found that students who were exposed to 36-50% of online BL outperform their colleagues who were exposed to less than 30% of online or 100% f2f delivery format. They recommend at least one-third of the traditional f2f time to be replaced with online activities. It can be concluded that online content should cover 30 to 79% of the educational materials, depending on the targeted mixing levels, and traditional learning should cover the remaining percentage.

In this research, the researchers test blending at three levels: 75%, 50% and 25% of online content, providing classroom instruction using the remaining percentages (see the Experimental Design of the Research below). This

research design was conducted to determine the most appropriate blending ratio between three traditional and e-learning blending levels in the "introduction to educational technology" course, and compare the effectiveness of these levels to the traditional instructional format in terms of developing students' academic achievement and determining their attitudes towards using BL at the College of Education (CoE), Sultan Qaboos University (SQU). The study proposes three different content structures for the "introduction to educational technology" course, in which each structure differs in its proportion of topics addressed and presented traditionally or electronically. The suggested structures are as follows:

1. The first structure delivers 75% of the course content traditionally in a physical classroom, and the remaining 25% of the course content is delivered remotely through Moodle®.
2. The second structure delivers 50% of the course content traditionally in a physical classroom, while the other 50% is delivered online through Moodle®.
3. The third structure delivers 25% of the course content traditionally in a physical classroom, and the remaining 75% is delivered online through Moodle®.

The research derives its importance from exploring ways to help the lecturers to determine and select the most appropriate blending ratio. It also bridges the gap in the literature by contributing with more research in this area.

METHODOLOGY

RESEARCH QUESTIONS AND HYPOTHESES

The study addresses the following questions:

1. What is the effect of different blending levels of traditional and e-learning delivery formats on developing students' academic achievement in the "introduction to educational technology" course at the CoE, SQU?
2. What is the effect of different blending levels of traditional and e-learning delivery formats on developing students' attitudes towards using BL in the "introduction to educational technology" course at the CoE, SQU?

The following research hypotheses were postulated:

1. There is a statistically significant difference at a level of <0.05 between the mean scores of the students of the first experimental group in the pre- and post- academic achievement tests, in favour of post application.
2. There is a statistically significant difference at a level of <0.05 between the mean scores of the students of the second experimental group in the pre- and post- academic achievement tests, in favour of post application.
3. There is a statistically significant difference at a level of <0.05 between the mean scores of the students from the second experiment and the control group in the post academic achievement test, in favour of the experimental group.
4. There is a statistically significant difference at a level of <0.05 between the mean scores of the students from the experimental groups and the control group in the post academic achievement test, in favour of the experimental groups.
5. There is a statistically significant difference at a level of <0.05 between the average scores of the students from the first experimental group in the post attitudinal scale application, and the hypothetical mean of the scale, in favour of post application.
6. There is a statistically significant difference at a level of <0.05 between the mean scores of the students from the second experimental group in the post attitudinal scale application, and the hypothetical mean of the scale, in favour of post application.
7. There is a statistically significant difference at a level of <0.05 between the mean scores of the students from the third experimental group in the post attitudinal scale application, and the hypothetical mean of the scale, in favour of post application.
8. There is a statistically significant effect at a level of <0.05 between the mean scores of the three experimental groups in the post academic achievement test.
9. There is a statistically significant effect at a level of <0.05 between the mean scores of the three experimental groups in the post attitudinal scale application.
10. There is a statistically significant difference at a level of <0.05 between the mean scores of the students from the second experimental group in the pre- and post- academic achievement tests, in favour of post application.

RESEARCH DESIGN

A) Model

This research follows an experimental approach, conducting a field study comprised of three experimental groups and one control group. The research variables are as follows:

- Independent variable: a study programme based on using BL with three levels: 75%, 50% and 25% of online content.
- Dependent variables:
  1. Students' academic achievement in the "introduction to educational technology" course.
  2. Attitudes towards using BL among students at the CoE, SQU.

The research adopts an experimental design; i.e. the "Two Randomised Groups Pre-test and Post-test Design" as shown in Fig. 1.

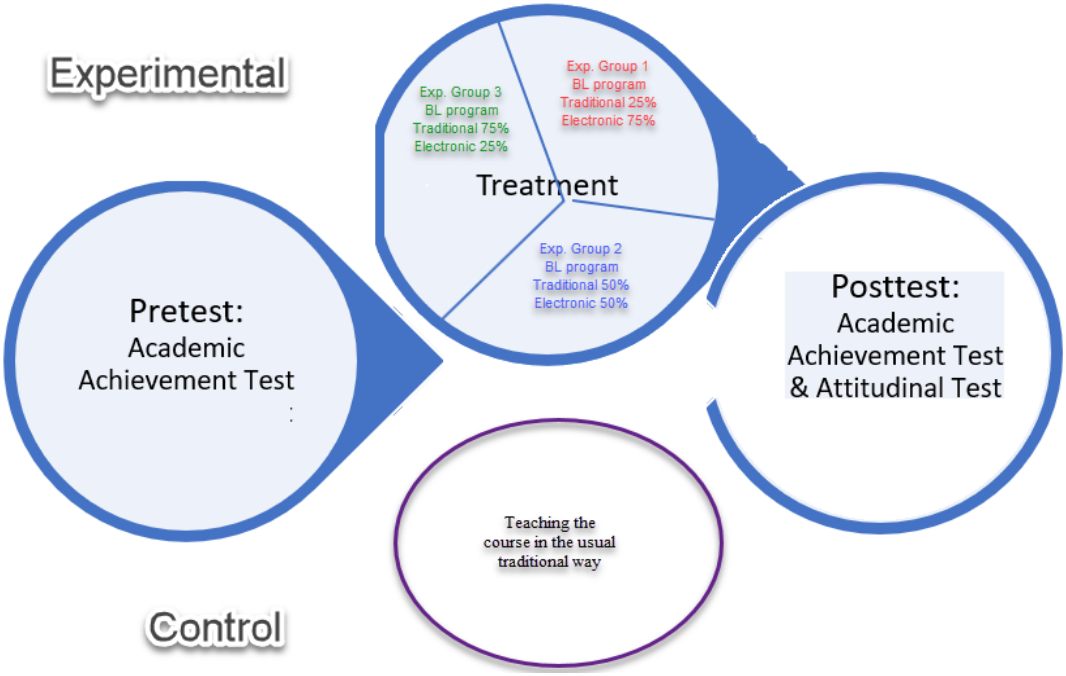

Fig. 1. Experimental design

B) Participants

The research project and its tools were piloted on a random sample of third-year students at the College of Education attending the "introduction to educational technology" course (TECH 3007) in the academic year 2017/2018. Then, it was applied experimentally on third-year students in the same college, attending the same course in the academic year 2018/2019.

The main research sample was selected from students of the CoE, SQU. These students were enrolled to study the TECH 3007 course in the fall semester of the academic year 2018/2019. Three groups of students in sections 11, 21 and 31 were randomly selected. The total number of students selected was 92. The students of section 11 were assigned as the first experimental group with (31) students, students of section 21 were assigned as the second experimental group with (30) students, and section 31 students were the third experimental group with (31) students.

C) Instrumentation

The research project used the following two data collection tools prepared by researchers:

1. Academic achievement test for third-year students attending the "introduction to educational technology" course (TECH 3007) in the CoE.
2. Attitudinal scale to measure students' attitudes towards using BL in the CoE, SQU.

- *Academic achievement test*

1. Preparation: This test is prepared to determine the effect of the different blending levels of traditional and e-learning delivery on students' academic achievement in the "introduction to educational technology" course at the CoE, SQU. Multiple-choice questions constitute the main format of the test items. Every question refers to a phrase related to the studied subject, followed by four alternative answers, one of which is correct. Students should answer it by ticking the correct option. The initial test form included twenty-two items. Students' responses are assessed by allocating one mark for each correct answer, and

a zero mark when selecting the incorrect option. Therefore, the minimum test score is zero, and the maximum score is twenty-two.

2. Validation: To measure the test validity, ten reviewers specialised in instructional technology from different colleges of education in various universities were asked to provide feedback about the suitability of the test's objectives and accuracy as well as the clarity and appropriateness of the test instructions. The agreement percentages between the reviewers' responses were calculated as shown in Table 2, and the test was modified accordingly.

Table 2. Reviewers' feedback agreement percentages about the academic achievement test items

Review element	Agreement percentage	Modifications made
Suitability of objectives	90%	-
Statement accuracy	80%	Some words were modified
Clarity	70%	Two paragraphs were deleted to avoid repetition

3. Reliability: A sample of Instructional Technology students at the CoE, SQU was piloted, and their response scores were calculated on the test. The test reliability was calculated using the "Kuder and Richardson Formula 21 test" to check its internal consistency. The value of the test reliability coefficient was 0.852, which can be trusted to ensure reliability of the results which will be obtained from the actual experimental sample.
4. Difficulty and discrimination coefficients: These are also calculated for each test item whereby the "Correction for Guessing Formula" was applied to calculate the item easiness coefficients. It is found that the values of the formula's coefficients effect range between (0.46) and (0.74).The "Johnson Equation" is also used to calculate the test items' discrimination coefficient. The values range between (0.38) and (0.71).
5. Final test form: Having achieved the previous steps, the final test form is prepared, consisting of twenty items with a 35 minutes response time, and a total of 20 marks. Table 3 shows the test specifications.

Table 3. Academic achievement test specifications for the "introduction to educational technology" course

N	Topic	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total	Relative weight%
1	Educational technology concepts	1	------	------	1	1	1	4	20
2	Educational communication	1	1	1	1	1	1	6	30
3	Educational media design	1	1	1	1	------	1	5	25
4	New media	1	1	1	------	1	1	5	25
Total		4	3	3	3	3	4	20	100
Relative weight%		20	15	15	15	15	20	100	

- *Attitudinal scale towards using BL*

1. Preparation: This scale is prepared to investigate the effect of the different blending levels of traditional and e-learning delivery on students' attitudes towards using BL. The scale content is comprised of 38 statements related to BL applications, and were collected and distributed randomly; half of which reflect positive attitudes, while the other half reflect negative attitudes towards using BL. The scale is constructed according to a five-point Likert scale, in which strongly agree is given the highest score (5), and strongly disagree is given the lowest score (1). Students respond to each statement by ticking one of the five alternatives that express their degree of approval to a particular statement. The lowest score on the scale is (38) and the maximum score is (190). The scale was drafted with instructions explaining its objectives, the need to

respond to each statement and how to respond to them, in addition to demographic data (name, college, specialisation, gender).

2. Validation: The scale was validated in two different ways; content validity and logical validity. Content validity is represented by the statement phrasing so that each statement expresses one opinion of the students' attitudes. The logical validity is conducted by asking a group of faculty members from the Psychology and Instructional and Learning Technology Departments to review the appropriateness of the scale statements in terms of the objective, statement wording, and integrity and clarity of instructions. The agreement coefficient percentages between their responses are calculated as shown in Table 4. The test was modified accordingly, and the number of scale statements is reduced to (34).

Table 4. Agreement percentages between reviewers' responses about the attitudinal scale statements

Review element	Agreement percentage	Modifications made
Suitability for objectives	90%	-
Statement accuracy	85%	Some words were amended
Clarity	80%	Four statements (2 positive/2 negative) were deleted to avoid repetition

3. Reliability: The scale was applied in its preliminary form to an exploratory research sample to determine the extent of its reliability and validity, as well as to modify the statements that are deemed vague or incomprehensible and ensure their usability for the experiment. The scale reliability was calculated through the re-application method in which the scale was reapplied to the exploratory sample a few weeks later to avoid the first application effect. The sample responses were then scored for both applications and Pearson's equation was calculated to find the correlation coefficient between the two applications. The coefficient value is statistically significant (0.822) at the level of (0.01). This result shows the scale's reliability, and ensures the reliability of the results to be obtained from the sample in the field experiment.
4. Final scale form: Based on the above results and modifications, the final scale consists of the cover letter, demographic data, and instructions followed directly by the (34) statements measuring attitudes towards using BL, with a lowest possible score of (34) and a maximum score of (170).

D) Process

- *Designing and producing the BL program*

I. ***Analysis/Design stage:*** This stage involves the following steps:

1. Defining the BL program general objectives: Setting goals is an initial step to building the remaining elements of the program, as goals define the program content, educational strategy, educational media, and appropriate evaluation tools.
2. Determining the target group characteristics: The target group is third-year students at the CoE, SQU. Their backgrounds, interests and intellectual levels were analysed and identified.
3. Determining the BL program content: The program content includes the course knowledge structure. The course covers concepts of instructional media and educational technology, and their role in the teaching and learning processes. In addition, it demonstrates the historical developments of this field, the communication models, and the design principles. It also introduces new instructional technologies.
4. Defining the learning environment: a theoretical session is conducted in a traditional learning environment to introduce the course cognitive structure. Computer labs are used to display how the experimental groups can access and use the e-platform and its interactive tools.
5. Determining the BL program behavioural objectives: Identifying the program content, units and lessons helps to formulate the behavioural objectives for each unit and lesson in a procedural manner that can be observed and measured to explore the degree to which they have been achieved (e.g. the students are required to apply visual design principles, design and produce a set of new media, use different instructional media, and evaluate some instructional media).
6. Determining the content presentation methods: The content presentation methods are determined after setting the BL programme behavioural objectives. Thus, different online content percentages are delivered to each group.
7. Designing educational activities: A set of educational activities is designed in accordance with theoretical and practical lessons, considering the electronic nature of e-learning delivery.
8. Designing the educational platform: Designing the e-learning part of the BL programme includes the following sub-steps:
   I. Setting up an online study plan flowchart.
   II. Preparing a complete blueprint to illustrate the program pages and hyperlinks.
   III. Designing the programme page content for students' navigation.

IV. Designing the main page including ten icons easing movement between the programme pages.

9. Designing the interaction modes: The BL programme includes several interaction modes, namely:
   I. Student-content interaction through internal links within the content, and continuous assessment of the lessons.
   II. Student-online platform interface interaction.
   III. Traditional face-to-face interaction through in-class theoretical lessons, during the course hours, according to the prescheduled sessions.
10. Identifying the feedback strategy: The feedback is designed through self-assessment, where students receive their results to every question after answering it, or the grading of students' activities and assignments through the platform email. Additionally, teachers can assess students' performance during the classroom meetings.
11. Designing the assessment tools: The assessment tools are designed to include a set of objective questions following the completion of each course topic. These tools are: an achievement test for the cognitive part of the course, and a scale measuring attitudes towards using BL.

II. ***Production stage***: This stage involves:
1. Production of the educational platform.
2. Connecting the platform with the interactive tools.
3. Initial production of the platform.

III. ***The evaluation stage:*** This stage involves:
1. Evaluation of the platform structure.
2. Experimentation of the platform on the pilot sample.
3. Modifications and final production of the platform.

IV. ***The field application stage:*** This stage involves:
1. Approval and accessibility of the educational platform.
2. Implementation of the instructional strategies: The proposed BL instructional strategies are implemented on the three experimental groups and the control group.

- *Fieldwork procedures*

The research experiment was conducted in three steps:

A. Pilot research:

The pilot experiment was conducted to:
a) calculate the validity and reliability of the two research tools,
b) modify the proposed designs for BL environments in light of: students' responses, their suggestions, and their observations thereon,
c) identify the difficulties that the researchers may face during the implementation stage,
d) determine the necessary time plan for implementing the field experiment
e) gain experience in the field application of the research.

The pilot experiment was conducted on a sample of 29 students from the CoE, SQU, who were enrolled in the Techno 3007 course section in the spring semester of the academic year 2017/2018. The following procedures were followed to implement the pilot experiment:
1. The pilot experiment began in the spring semester of the academic year 2017/2018, between Sunday 11/3/2018 to Thursday 29/3/2018.
2. The BL environment and the two research tools were applied to the students.
3. Reliability, validity, response time, discriminatory factors, ease and difficulty coefficients were applied for the achievement test. Validity and response time were calculated for the attitudinal scale.
4. A teaching time plan was set using the BL environment in light of the pilot experiment. It was found that the average time taken to learn basic knowledge is three weeks. Therefore, implementation of the basic research experiment would require five weeks; three of which for the learning process, and two weeks for the pre- and post- application of the research tools.
5. The main research sample was accordingly selected (see the 'Participants' section above)

B. Field research:

The field research experiment was conducted in the following steps:

1) Pre-application of the academic achievement test: The test was applied to the research sample directly before starting learning in the BL environment from Sunday 7/10/2018 until Wednesday 10/10/2018. The researchers clarified the purpose of the test to the students, asked them to adhere to its instructions and emphasised the need to respond to all test items. The test was then corrected, and the students' grades were checked in preparation for statistical treatment.
2) Implementation of the research experiment:
   - Duration of the experiment: The research experiment lasted five weeks during the fall semester of the academic year 2018/2019. It started on Sunday 7/10/2018 until Wednesday 7/11/2018. The academic achievement test was applied in the first week to all students of the research sample. Both research tools were applied in the last week for all students. The time period for learning the course topics for the three groups was therefore three weeks.
   - Implementation procedures of the experiment: The students of the three experimental groups studied the course topics and implemented the predetermined educational strategy within the computer labs of the college. The learning session was four hours divided into two days per week. Each group was assigned to a Moodle® educational site specifically designed to its blending requirements.
   - Post application of the two research tools: After completing the research experiment, both the academic achievement test and attitudinal scale were applied to the students of the three groups from Sunday 4/11/2018 until Wednesday 7/11/2018, followed by the correction of the students' responses. The grades were checked with the name of each student and his/her grade in both instruments in preparation for statistical treatment. The appropriate statistical methods were then used to answer the research questions.

C. Data analysis

The research uses the following data analysis and statistical methods:

- To determine the effectiveness of each proposed BL program on the two research variables, a t-test was used to calculate the statistical difference between the mean scores of the experimental groups' pre- and post- applications for each tool separately.
- Eta squared (η2) and the corresponding value of (d) were used to determine the extent to which each BL program affects the two research variables separately.
- To determine the effectiveness of the BL program in comparison with the traditional method on the two research variables, the mean of the adjusted gain scores ratio between the experimental and control groups are calculated for the two research tools separately. Then, the t-test was used to calculate the statistical difference between the mean of the adjusted gain scores ratio in the experimental groups and the control group for the two research tools separately.
- To determine the effect of different blending levels of traditional and e-learning delivery formats on the two research variables separately, one-way analysis of variance (ANOVA) was used to calculate the statistical difference between the mean scores of the experimental group students in the post-application of each tool separately.

RESULTS

RQ1: What is the effect of different blending levels of traditional and e-learning delivery formats on developing students' academic achievement in the "introduction to educational technology" course at the College of Education, SQU?

- ***Ensure group equivalence:***

The mean scores of the three experimental groups were calculated in the pre- achievement test, and the one-way analysis of variance (ANOVA) test was applied. Table 5 summarises the findings.

Table 5. ANOVA results in the pre- achievement test

Source of Variance	Sum of squares	DoF	Average squares	p	Sig.
Between groups	0.348	2	0.174	0.253	0.777
Within groups	60.377	88	0.686		
Total	60.725	90			

Table 5 shows that the "p" value is not significant at the level of ≤0.05 confirming no significant differences between the mean scores of the three research groups in the pre-test; indicating equivalence of these groups in the academic achievement component.

- ***Student academic achievement in post-test application:***

The mean scores of the three experimental groups were calculated in the post- achievement test, and the one-way analysis of variance (ANOVA) test was applied. Table 6 summarises the findings.

Table 6. ANOVA results in the post- achievement test

Source of Variance	Sum of squares	DoF	Average squares	p	Sig.
Between groups	4.27	2	2.135	0.9	0.41
Within groups	208.763	88	2.372		
Total	213.033	90			

Table 6 shows that the "p" value is not significant at the level of ≤0.05 confirming no statistically significant differences between the mean scores of the three experimental groups in the post- achievement test. This indicates no statistically significant effect at the level of ≤0.05 for different blending levels on students' academic achievement. Accordingly, the first hypothesis was verified and rejected, whereas the alternative hypothesis is accepted.

In order to understand the three BL environments' effectiveness, and the extent of their impact on developing the three experimental groups' academic achievement, a t-test for two interrelated groups was applied, followed by calculating the Eta (η^2) value and its corresponding (d). Table 7 summarises the findings.

Table 7. Descriptive statistics and values of t, η^2 and d for the experimental groups' scores in the pre- and post-achievement tests.

Group	M		SD		t	DoF	Sig.	η^2	d
	Pretest	Posttest	Pretest	Posttest					
First	1.9667	17	1.35146	1.36458	58.75	29	0.0	0.9916	21.729
Second	1.7742	16.5161	1.17501	1.5464	38.004	30	0.0	0.9796	13.859
Third	1.1333	16.6333	0.77608	1.67091	43.297	29	0.0	0.9847	16.044

Table 7 shows that:

- The difference between the mean scores of the first experimental group of students in the pre- and post-academic achievement tests is statistically significant at the level of (0.00), in favour of post-application. In addition, the total variance of this group's academic achievement reached the value of (0.9916), due to the effect of using the first BL environment. This indicates that using the first BL environment affects CoE students' academic achievement with a percentage of (99.16%). The extent of this effect exceeds the value of (0.8) as it reached (21.729), indicating a major impact from using the first BL environment on developing students' academic achievement.
- The difference between the mean scores of the second experimental group of students in the pre- and post-academic achievement test is statistically significant at the level of (0.00), in favour of post-application. In addition, the total variance of this group's academic achievement reached the value of (0.9796), due to the effect of using the second BL environment. This shows that using the second BL environment affects CoE students' academic achievement with a percentage of (97.96%). The extent of this effect exceeds the value of (0.8), as it reached (13.859), indicating a major impact from using the second BL environment on developing students' academic achievement.
- The difference between the mean scores of the third experimental group of students in the pre- and post-academic achievement test is statistically significant at the level of (0.00), in favour of post-application. In addition, the total variance of this group's academic achievement reached the value of (0.9847), due to the effect of using the second BL environment. This means that using the second BL environment affects CoE students' academic achievement with a percentage of (98.47%). The extent of this effect exceeds the value of (0.8), as it reached (16.044), indicating a major impact from using the third BL environment on developing students' academic achievement.

RQ2: What is the effect of different blending levels of traditional and e-learning delivery formats on developing students' attitudes towards using BL in the "introduction to educational technology" course at the CoE, SQU?

The mean scores of the the three experimental groups were calculated in the post-application of the attitudinal scale, and the one-way analysis of variance (ANOVA) test was applied. Table 8 summarises the findings.

Table 8. ANOVA results for the post- attitudinal scale application

Source of Variance	Sum of squares	DoF	Average squares	p	Sig.
Between groups	390.8234	2	195.417	2.828	0.065
Within groups	6081.276	88	69.105		
Total	6472.11	90			

Table 8 illustrates that the "p" value is not significant at the level of ≤0.05 confirming no statistically significant differences between students' mean scores in the three experimental groups. This indicates no statistically significant effect at the level of ≤0.05 for different blending levels on students' attitudes towards using BL. This clarifies that the first hypothesis was verified and rejected, whereas the alternative hypothesis is accepted.
In order to understand the three BL environments' effectiveness, and the extent of their impact on developing students' attitudes towards using BL in the three experimental groups, a t-test for two interrelated groups was applied, followed by calculating the value of the Eta (η^2) and its corresponding value of (d). Table 9 summarises the findings.

Table 9. Descriptive statistics, values of t, η^2 and d for the experimental groups' scores in the pre- and post-attitudinal scale applications

Group	M		SD		t	DoF	Sig.	η^2	d
	Pretest	Posttest	Pretest	Posttest					
First	144.5	156.6	0.00	8.67656	7.638	29	0.00	0.6679	2.836
Second	144.5	151.9032	0.00	9.48808	4.344	30	0.00	0.3861	1.586
Third	144.5	151.4667	0.00	6.98636	5.462	29	0.00	0.5071	2.028

Table 9 shows that:

- The difference between the mean scores of the first experimental group of students in post-application, along with the hypothetical mean value of the attitudinal scale are statistically significant at the level of (0.00), in favour of post-application. Moreover, the total variance of the first experimental groups' academic achievement reached the value of (0.6679), due to the effect of using the first BL environment. This means that using the first BL environment affects CoE students' attitudes towards BL with a percentage of (66.79%). The extent of this effect exceeds the value of (0.8) as it reached (2.836), indicating a major impact from using the first BL environment on developing students' attitudes towards BL.
- The difference between the mean scores of the second experimental group of students in post-application, along with the hypothetical mean value of the attitudinal scale are statistically significant at the level of (0.00), in favour of post-application. Additionally, the total variance of the first experimental groups' academic achievement reached the value of (0.3861), due to the effect of using the first BL environment. This shows that using the second BL environment affects CoE students' attitudes towards BL with a percentage of (38.61%) The extent of this effect exceeds the value of (0.8) as it reached (1.586), indicating a major impact from using the second BL environment on developing students' attitudes towards BL.
- The difference between the mean scores of the third experimental group of students in post-application, along with the hypothetical mean value of the attitudinal scale are statistically significant at the level of (0.00), in favour of post-application. Further, the total variance of the first experimental groups' academic achievement reached the value of (0.5071), due to the effect of using the first BL environment. This means that using the third BL environment affects CoE students' attitudes towards BL with a percentage of (50.71%). The extent of this effect exceeds the value of (0.8) as it reached (2.028), indicating a major impact from using the third BL environment on developing students' attitudes towards BL.

DISCUSSION AND CONCLUSIONS

This study was conducted to determine the most appropriate blending ratio between three traditional and e-learning blending levels in the "introduction to educational technology" course, and compare the effectiveness of these levels to the traditional instructional format in terms of developing students' academic achievement and attitudes towards using BL at the CoE, SQU.

- ***The academic achievement research findings can be summarised as follows:***
  1. There is a statistically significant difference at a level of <0.05 between the mean scores of the first experimental group of students in the pre- and post-academic achievement tests in the "introduction to educational technology" course, in favour of the post-test.
  2. There is a statistically significant difference at a level of <0.05 between the mean scores of the second experimental group of students in the pre- and post-academic achievement tests in the "introduction to educational technology" course, in favour of the post-test.

3. There is a statistically significant difference at a level of <0.05 between the mean scores of the third experimental group of students in the pre- and post-academic achievement tests in the "introduction to educational technology" course, in favour of the post-test.
4. There is a statistically significant difference at a level of <0.05 between the mean scores of the first experimental group and the control group in the post academic achievement test, in favour of the experimental group.
5. There is a statistically significant difference at a level of <0.05 between the mean scores of the experimental group and the control group in the post-academic achievement test, in favour of the experimental group.
6. There is a statistically significant difference at a level of <0.05 between the mean scores of the third experimental group and the control group in the post-academic achievement test, in favour of the experimental group.
7. There is no statistically significant effect at a level of <0.05 between the mean scores of the three experimental groups in the post academic achievement test in the "introduction to educational technology course".

The above results are consistent with the studies of Abdel-khaleq (2010), Reda (2012), Alajab and Hussain (2015), Tawfiq and Jaafar (2017) and Al-Qahtani (2018), who have found statistically significant differences between the mean scores of the control and experimental groups' post-academic achievement tests in favour of the experimental groups. These results also reveal the effectiveness of using a BL strategy with all blending ratios in teaching, which is consistent with results by Allen et al. (2007), who defined BL as a course in which the electronic content percentage ranges between (30%-79%). The researchers attribute this result to the ability of different blending levels to meet students' needs in the three groups, by controlling self-learning pace and allowing them to absorb the subject content. Furthermore, although blending proportions vary, more interaction and connection opportunities replace the traditional method through platforms and online means. This helps students find more information to integrate into learning: independently and thoroughly as indicated by Ahmad (2011) and Zhonggen and Yuexiu (2015).

- ***The findings which report attitudes towards BL can be summarised as follows:***
  1. There is a statistically significant difference at a level of <0.05 between the average scores of the first experimental group of students in the post-attitudinal scale and the hypothetical mean of the scale, in favour of post-application.
  2. There is a statistically significant difference at a level of <0.05 between the average scores of the second experimental group of students in the post-attitudinal scale and the hypothetical mean of the scale, in favour of post-application.
  3. There is a statistically significant difference at a level of <0.05 between the mean scores of the third experimental group of students in the post-attitudinal scale and the hypothetical mean of the scale, in favour of post-application.
  4. There is no statistically significant difference at a level of <0.05 between the mean scores of the three experimental groups in the attitudinal scale post-application.

The above results are consistent with the results of Abdel-khaleq (2010), Ahmed (2011), Alajab and Hussain (2015), Banyen et al. (2016), and Tawfiq and Jaafar (2017); confirming positive student attitudes towards using BL. Notably, the study sample prefers using BL as it changes the traditional teaching method and makes learning more flexible.

In light of the above findings, the study recommends:

1. More attention to using BL strategies in all blending ratios/proportions to teach different courses, and develop understanding/thinking.
2. Directing educational technology research to study the relationship between BL and teaching different technology courses.

The study also recommends:

1. Conducting more research concerned with the use of BL strategies in all blending ratios/proportions on other research variables and different study courses.
2. Researching the relationship between the use of BL in all blending ratio/proportions and students' learning, investigating different research variables and cognitive abilities.
3. Evaluating the use of other BL strategies in all blending ratios/proportions in teaching different subjects.

Some limitations exist in this study, including the use of BL strategies in all blending proportions with only two research variables. Further attention needs to be paid to other variables including cognitive abilities and different

subjects of study. Additionally, the use of BL was investigated within the higher education context and the need exists to evaluate the effectiveness of using BL in teaching different curricula on pre-university students.

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The Effectiveness of Form Four Stem-Based Physics Interactive Laboratory (I-Lab) By Employing Isman Instructional Design Model

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ABSTRACT
The study examines the effectiveness of the Form Four STEM-Based Physics Interactive Laboratory (i-Lab) to enhance form four students' achievements in Physics. It describes the design process by employing the Isman Instructional Design Model. A quantitative study was carried out using an experimental method. The instruments used were pretest and posttest for form four students' achievements in Physics. The sample of this study consists of three groups: a Traditional Physics Laboratory (T-Lab); Form Four STEM-Based Physics Interactive Laboratory with explanation feedback (i-LabP); and Form Four STEM-Based Physics Interactive Laboratory with knowledge of results (i-LabK). In this study, T-Lab is control groups while i-LabP and i-LabK are treatment group. Each group had 20 participants. Statistical analysis in the form of One Way Anova was used to compare the achievements of students in each group (T-Lab, i-LabP & i-LabK). The findings show that i-LabP had highest score mean at 64.70, followed by i-LabK at 56.90 and T-Lab at 52.65. The findings from this study suggest that the Isman Instructional Design Model is suitable in the development of Form Four STEM-Based Physics Interactive Laboratory (i-Lab) to enhance form four students' achievements in Physics.

INTRODUCTION
Teaching and learning Science must be based on today's Science and Technology development. Students are now more exposed to an explosion of information technology in their daily lives. In that regard, from the very beginning of the 19th century, educators, policy makers and the general public have focused on science teaching and learning. In the twenty-first century, science teaching requires an efficient approach to help students deepen and master their understanding of Science. One of the reforms in Science teaching is through the STEM (Science, Technology, Engineering & Mathematics) approach known as "Integrated STEM". STEM based physics teaching and learning embraces creative and engaging activities for students. In addition to producing innovative learning, the STEM Based Physics Interactive Laboratory (i Lab) is an innovation in physics laboratory modules which incorporates Science, Technology, Engineering and Mathematical elements to develop critical thinking and problem solving (Wan Ab Kadir, Abdullah, & Mustapha, 2019). Additionally, integrating technology in education will enhance the transformation of wisdom and thinking and learning for students (Gopalan, Bakar, & Zulkifli, 2017).

Labs are places where students can practice hands-on theoretical learning. The laboratory is known as a Science teaching place that involves students in concrete experience with science equipment and concepts (Ganiel & Hofstein, 1981). In laboratories, students will gain training and practical skills. Laboratory studies in Science (Physics / Chemistry / Biology) are very important for students to prove the theory learned in the classroom is true and proven. A theory can be demonstrated when students practice in laboratories. It is a common term for explaining activities related to the observation, testing and experiment or practice conducted by students (Kamarudin, & Halim, 2014 ; Trumper, 2003).

BACKGROUND
Modules are a form of interactive learning media that can be used for self-learning. Along with the development of information and communication technology or ICT, modules now appear not only in print, but also in the form of interactive modules based on the use of computers. An Interactive Module is an innovation of teaching aid, whether the teaching and learning process is run in the classroom or in the laboratory. Interactive modules can be implemented using internet applications either "online" or "offline" without internet applications. Many

early researchers have developed interactive modules to enhance the effectiveness of learning (Alias et al., 2014 ; Lee, & Osman, 2012 ; Penispaningam et al., 2014). In addition, interactive lab learning can have a good impact student learning as well as attracting students (Wan Ab Kadir, Abdullah, & Mustapha, 2019 ; Abdullah, & Yaakob, 2019).

In this study, Form Four STEM-Based Physics Interactive Laboratory (i-Lab) refers to a module of interactive learning comprised of Form Four Physics notes, procedures of Form Four Physics experiments, videos of Form Four Physics experiments, and quizzes. Form Four STEM-Based Physics Interactive Laboratory with explanation feedback is known as (i-LabP). Explanation feedback is a feedback form that describes the student as to why the answer given is correct or incorrect (Clariana, Ross, & Morrison, 1991). Form Four STEM-Based Physics Interactive Laboratory with knowledge of results is known as (i-LabK). Decision-making feedback is a fairly simple response which simply states whether the response given is right or wrong, without giving the user a real answer (Clariana, Ross, & Morrison, 1991).

PROBLEMS ARISING IN PHYSICS LEARNING

Student achievement in Physics shows that a lack of student understanding of Physics concepts and Physics experiments may be linked to students' interest in Physics Kamaruddin, & Halim, 2014 ; Phang et al., 2014 ; Zakaria et al., 2017). In addition, students are also less interested in the subject of Physics. They find that physics is a very difficult subject to study because it covers abstract concepts and concepts that students need to understand, as well as solving problems that require mathematical calculation applications [13]. In addition, a students' lack of interest in Physics is due to their perceptions of Physics and conventional teaching approaches by teachers (Phang et al., 2014 ; Zakaria et al., 2017).

OVERVIEW OF MODULE LEARNING

Many Physics modules that have been run by previous researchers who integrate ICT in teaching and learning and need to be accessed online such as (Alias, & Siraj, 2012 ; Alias et al., 2013a). In addition, most of the Physics modules that have been developed are physics modules to enhance students' understanding of abstract physics concepts more easily and to enhance student achievement as practiced by researchers (Alias, & Siraj, 2012 ; Alias et al., 2013a ; Alias et al., 2013b). However, few practical modules that use STEM approaches and are accessible offline have been developed to overcome the obstacles faced by students and teachers in physics labs. Development of Physics Interactive Labs (i-Lab) is STEM based to enhance students' knowledge and skills in STEM so that they can pursue higher education while continuing their lifelong learning. In addition, students will be able to apply STEM knowledge, skills and values through inquiry, daily solutions, environment and local and global community (Shahili, Ismail, & Halim, 2017).

OBJECTIVES

1. Evaluate the effectiveness of the Form Four STEM-Based Physics Interactive Laboratory (i-Lab) based on traditional laboratory (T-Lab), interactive laboratory with decision knowledge feedback (i-LabK) and interactive laboratory with explanation feedback (i-LabP) on student achievement in Physics by pre and posttest design.

2. Describe the design and development of Form Four STEM-Based Physics Interactive Laboratory (i-Lab) to enhance form four students' achievements in Physics by employing the Isman instructional design model on expert agreement.

METHODOLOGY

In this study, 60 form four students who take Physics in the state of Perak were randomly selected. The samples were divided into three groups: T-Lab, i-LabP and i-LabK. T-Lab was a control group using traditional laboratory learning, while the i-LabP and i-LabK were treatment group. In this research, the form four students' achievements in Physics refer to the difference between pre- and post-test scores.

The first instrument was pretest for identifying student's prior knowledge. The second instrument was posttest for identifying student's achievement. Both instruments pretest and posttest were the same questions which different arrangement. Student achievement in this study refers to post-test scores by controlling for pre-test score factors. Pre and post test instruments were validated by three Physics Lecturer and have Cronbach alpha 0.918.

EMPLOYING ISMAN INSTRUCTIONAL DESIGN MODEL IN THE DEVELOPMENT OF FORM FOUR STEM-BASED PHYDSICS INTERACTIVE LABORATORY (i-LAB)

Teaching is a process of planning teaching and learning activities. Teaching models are implemented to motivate students to learn [18]. In a learning model, several factors need to be considered. There are also factors that need

to be included in the steps of developing a teaching (Isman 2011 ; Isman 2005). In other words, the learning model is very important for developing a lesson and an activity to be carried out. This study is based on Isman's Teaching Design Model (2011).

Isman's Teaching Design Model has a primary purpose of how to effectively plan, develop, implement and carry out learning activities (Isman, 2011). This model was developed based on the views of several key learning theories such as behaviorism, cognitive and constructivism (Alias et al ., 2013a ; Siraj, Alias, & Dewitt, 2013). Isman's Teaching Design Model (2011) used the relationship between stimulus and response, reinforcement factor, and their environment as behaviorism theory to motivate students. The model also focuses on how to preserve knowledge in the long term memory and each planned activity must have that purpose (Siraj et al., 2013)

Isman's model was implemented on 100 graduates from the faculty of education at the University of Eastern Mediterranean to determine the effectiveness of the model on student achievement. It was found that the Isman Model can work effectively and has a positive impact on the achievement of the graduates (Isman, 2005). In addition, the Isman Model is widely used to see the effectiveness of a teaching on high school students as previously conducted by researchers (Alias, & Siraj, 2012 ; Alias et al., 2013a ; Alias et al., 2013b). Isman's model was used in the Design & Development Research method (DDR) (Alias, & Siraj, 2012 ; Alias et al., 2013a ; Alias et al., 2013b) in her study to test the effectiveness of a learning. Therefore, Isman's Teaching Design Model (2011) can be applied in the DDR method. The model consists of five systematic plans: input, process, output, feedback and learning. Figure 1 shows the Isman Teaching Design Model 2011.

Teaching is a process of planning teaching and learning activities. Teaching models are implemented to motivate students to learn (Isman, 2011). In a learning model, several factors need to be taken into account. There are also factors that need to be included in the developmental steps of a teaching (Isman 2011 ; Isman, 2005). In instructional design, the steps are interrelated with each other. It is very important to arrange the steps in a logical way and relate to the other steps. In other words, instructional design is a big responsibility for planning teaching and learning activities. In other words, learning modules are very important to develop a lesson and activities that will be carried out. This study was developed based on Isman's (2011) Instructional Design Model. The Isman Instructional Design Model has a main purpose which is how to plan, develop, implement and carry out learning activities effectively (Isman, 2011).

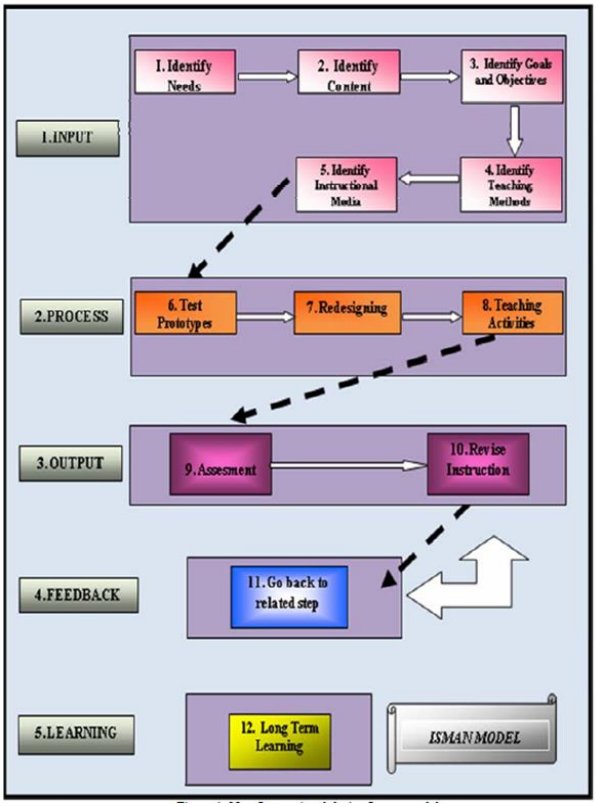

Figure 1: New Instructional design Isman model (Isman, 2011)

DATA COLLECTION

Isman model with a new instructional design based on active learning. During teaching and learning activities, students are active and use cognitive learning to build new knowledge. To create new knowledge, technological tools in education are used. The Isman model with the new instructional design (Figure 1) has five phases namely input phase, process phase, output phase, feedback phase and learning phase (Isman, 2011). Figure 2 showed the Isman Model applications in this study:

Phase	Steps	Explanation
INPUT	Identify needs • Identify content • Identify goals and objectives • Identify teaching methods • Identify teaching media	• Plan the construction of i-Lab modules through needs analysis to find out the needs for Physics modules as well as problems encountered in Physics subjects as well as Physics practice. • Content, teaching methods and pursuit media are determined based on expert agreement.
PROCESS	• Testing prototypes • Updating instructional design • Teaching and learning activities	• Prototypes (i-Lab modules) are tested for effectiveness with students • Rearrange teaching activities • Pre -tests are conducted on students • Teachers begin teaching activities through content, teaching methods, goals and objectives with appropriate teaching media.
OUTPUT	• Assessment • Review teaching	• Teachers to perform assessment on students to find out the learning objectives achieved/not (Post Test) • The teaching process is reviewed if problems are encountered during the learning
FEEDBACK	• Return to the relevant steps	• Teachers can return to any problematic step
LEARNING	• Long -term learning	• Long -term learning is certified by the teacher (as required by the learning objectives)

Figure 2: Applications of Isman Models in the Development of Form Four STEM-Based Physics Interactive Laboratory (i-Lab). Addapted (Isman, 2011)

FINDINGS

From table 1, I-LABP have the highest mean score (64.70), followed by I-LABK (56.90) and the lowest mean score is T-LAB (52.65). This results shows that I-LABP & I-LABK have more effective for students' achievement in Physics more than T-LAB.

Table 1: Descriptive Analysis of Mean Score Between i-LabK, i-LabP & T-Lab

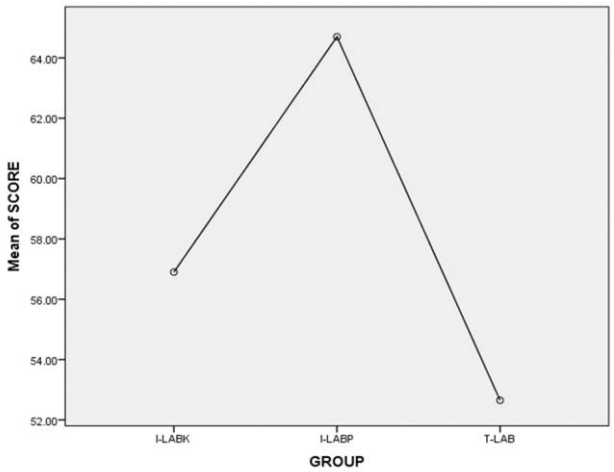

Table 2 indicates that there is a significant difference in students' achievement levels based after treatment through teaching and learning using I-LAB module. This is clearly being shown when the mean between group

for posttest is 747.017 and the mean within group is 114.255 with test $F(2,57) = 6.538$, $p < .05$. Therefore, there is a significant difference in students' achievement in the treatment group posttest.

Table 2: One way ANOVA Students Achievement Between Group

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1494.033	2	747.017	6.538	.003
Within Groups	6512.550	57	114.255		
Total	8006.583	59			

Figure 3 shows that I-LABP have highest mean score compare with I-LABK and T-LAB. It can be concluded as I-LABP is most effective for students followed by I-LABK and T-LAB.

Group	Sample	Mean	Std. Deviation	Std. Error
I-LABK	20	56.9000	9.35780	2.09247
I-LABP	20	64.7000	11.54442	2.58141
T-LAB	20	52.6500	11.04191	2.46905
Total	60	58.0833	11.64924	1.50391

Figure 3: Means of Score Students Achievement between Groups

CONCLUSIONS

The findings show that Form Four STEM-Based Physics Interactive Laboratory with explanation feedback (i-LabP) and Form Four STEM-Based Physics Interactive Laboratory with knowledge of results (i-LabK) give positive effectiveness of form four student's achievement in Physics. The results show that treatment group which is I-LABP and I-LABK have greater mean score than control group, Traditional Physics Laboratory (T-Lab).

RESEARCH IMPLICATION

The development of i-Lab has many implications for education. For students, the development of i-Lab can attract students and facilitate student learning. For teachers, i-Lab can be used as a teaching tool to replace existing practical books, in addition to helping teachers carry out the teaching and learning process at the school. Development of i-Lab is able to produce unique modules, as each component is developed based on a specialist agreement in the field of Physics education, which is an advantage to the Ministry of Education Malaysia. Additionally, i-Lab is a very suitable teaching and learning medium for teachers and students especially during movement control order (MCO) where students can learn by their own and teachers as facilitators.

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The Evolution of Italian E-Learning between the Two Millenniums (1995-2005)

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ABSTRACT
This essay tries to trace the most important steps of Italian e-learning between 1995 and 2005, a crucial time for the success of the Distance Learning in Italy. From the first degree course entirely in e-learning (by the Politecnico di Milano) some excellence e-learning centers of research and experimentation were born until the institutionalization of the telematic universities, and in these years they laid the basis of the actual e-learning panorama.

Despite the technologic, infrastructural and cultural gap with other European countries and in accordance with the evolution of pedagogical models between 1995 and 2005, e-learning became an increasingly high value option for almost all the University community.

FROM SECOND TO THIRD GENERATION OF DISTANCE LEARNING
The decade 1995-2005 has been crucial in e-learning history in Italy and in the rest of Europe, thanks to the transition from distance learning second generation, the multimedia distance learning, to the third generation, i. e. e-learning: the way to benefit at the maximum level the ICT educational potential and that of broadband internet (Bontempelli, s.d.)

The second distance learning generation came after the first one, that of distance learning by mail adopted since the late '800, before the spread of radio and television and afterwards with the invention of the first personal computers in the years '60, '70 and '80. The primitive form of distance learning by mail evolved in multimedia learning: on paper but also television broadcasts, videotapes, videorecords, the first IT programs on floppy disk and CD-roms.

In Italy, just in the decade between the two centuries with the birth of e-learning the didactical and educational processes started to completely change from the technological and methodological as well as the structural point of view. The third generation of distance learning, namely e-learning, is in fact based not on the transmissive model but on the constructivist paradigm and, thanks to the net, allows to put at the centre of the learning process no longer the trainer but the trainee, seen as an interactive subject able to manage and build competences in a collaborative logic (Rivoltella, 2003)

The digital infrastructure of the net and the information and communication technologies (ICT) play a fundamental role in the e-learning development since they allow also the asynchronous communication and the implementation of new tools such as that of chats, forum and the creation of communities, functional to the learning by doing. The arrival in Italy of the distance learning has been delayed and prevented by the academic tradition of the Bel Paese, in addition to a late technological development. At the beginning it was seen as a backup plan for working students or disable people but later e-learning became an educational reality not discriminated but able to project the University towards the challenges of the new millennium.

NEW ECONOMY, NET AND DIGITAL REVOLUTION
The development of new technology, necessary base for the development of the e-learning, permeated and changed almost any field, starting from pedagogy where the IT revolution opened new teaching scenarios, improving new educational paradigms both in frontal teaching and distance learning.

From the early ’90, therefore after almost half century since the first didactical experiments at the radio and on TV, the digital revolution begins to enter in the houses in the same years when we are moving from old to new economy. In 1991 the world wide web was created, a technological basis for distance learning on the net (Fad, Formazione A Distanza), and among the most significant stages we can mention the widespread diffusion of the broadband suitable for video streaming.

Moving from the United States of America and from the most developed countries, technological progresses embraced also the Italian social and economic scenario. ICT budget slowly increased also in Italy, although it remained behind the other European Countries average allocated budget (Iammarino et al., 2001, p. 13) and above all with respect to the U.S.A., leader in e-learning development.

The low speed of ICT development compared to that of other industrialized countries has been largely discussed in those years.
“Digital divide” was imported at the end of last millennium from the U.S.A. to refer to an internet and wideband spread in Northern Italy, in the centre e especially in the South and peripherical areas and among the most disadvantaged classes.

Due to the “digital divide” (Pasquali, 2003) first experimental e-learning projects were implemented in the most economic relevant areas and with advanced technological equipment. Cultural opposition also deepened this gap: in the country the classic teaching model was transmissive and considered the sole teaching way worth being applied in a University; it lasted for centuries till the present time.

A big stimulus towards innovation is the EU Commission initiative *e-Learning – Designing tomorrow's education* dated May 2000 that aimed to “enhance the educational and teaching system evolution as well as the European transition towards a knowledge society” (Santagata & Tavoni, 2001).

NORTH
Without pretending to be exhaustive, we will now review the first pioneering experiments in this new field of teaching methodology in the diverse Universities in order to underline how this phenomenon, which began in the North on the quiet, spread in few years in almost each and every University.

MILANO LEADER IN E-LEARNING
With respect to e-learning technologies in Italy, Manlio Tommaso Gaddi (2005b, p. 47), comments:

“Le nuove TIC sono […] entrate nella didattica universitaria, ma in maniera non uniforme, più per l’interesse e la curiosità del singolo docente che sulla base di un progetto, e lentamente si vanno diffondendo, creando aspettative ma anche paure”.

e-learning pilot projects, that at that time was called “teledidattica”, were already operating at the end of ‘900 in diverse Academic Institutions, as well as in the enterprise sector for updating programs. Milan, the Italian economic capital, experimented e-learning at the largest stage collecting many records. The Statale University launched a virtual Campus managed by CTU, Centro di servizio per le Tecnologie e la didattica Universitaria multimediale e a distanza (Fiorentini, 2003, p. 17).

Since 1997 in the faculty of Political Sciences Guido Martinotti held the online course of Urban Sociology. The broadband net was not yet developed, and it was not possible to upload the video of the lessons on the platforms, so they were still distributed to the students on hard copies such videotapes or cd rom. The net, on the other hand, allowed to upload hypertexts with links to other subjects.

The turning point for the e-learning was the year 2000, when the Politecnico di Milano launched the fully e-learning degree course (first level) in IT Engineering Online thanks to the collaboration of Metid founded in 1996 (Metodi e Tecnologie Innovative per la Didattica) and directed by Alberto Colorni (2004; Colorni & Negrini, 2004), and with the technical and multimedia support of Somedia, company of the group *L’Espresso*.

This is where the Politecnico project “Laurea online” (LLP) moved its first steps. Colorni - who oversaw the first Italian tele didactic experiment in 1993, Deputy Rector for e-learning and didactic innovation, President of the Degree Course on IT Engineering online, has been one of the most relevant persons in the e-learning diffusion.
Benefiting from the prior Colorni’s experience, Politecnico improved the e-learning offer also as an orienteering tool for graduated students and as a support for subjects facing learning difficulties.

It is worth mentioning here the establishment, by Università del Sacro Cuore, of Cepad (Centro di Educazione Permanente e A Distanza; Zoffi, 2006) and Asit (Area Sistemi Informatici e Telematici) by Bocconi.

THE UNIVERSITY OF PADUA CAMPUS

Another big experimentation centre in e-learning has been that of University of Padua (Galliani & Costa, 2005). Many projects and experiments led in 2005 to the establishment of the E-learning centre of the Athenaeum, one of the most active among those operating in Italy. In particular, the Faculty of Educational Sciences has always shown great sensitiveness towards the didactic innovation and since the early '90 the course of IT for teaching was included in all its degree courses.

In 2003 Luciano Galliani, one of the founders of Italian e-learning, has been the scientific coordinator of the E-learning project of the Athenaeum along with other representatives, (Luigino Benetazzo, Coordinator of the Commission for distance learning and Antonella Tonoli project managing Coordinator). The project aimed to

"integrare ambienti reali e ambienti virtuali di apprendimento-studio-ricerca, ridefinendo con la sperimentazione e la condivisione di buone pratiche le categorie dello spazio e del tempo in relazione alla comunicazione didattica". (Gaddi, 2005a, p. 48).

Since in 1997-1998 Galliani had established the training course in "Educational Communication and multimedia learning" with an online learning section. The course was then relaunched in 1999 under the denomination "Multimedia and didactic" and was implemented entirely online (Manfredi-De Waal, 2005, p. 109).

In 2001 the degree course Net Manager was added and then updated in "Manager of networks and contents in digital environments". In 2003 the two degree courses were merged in the new course "Multimedia didactic and managing networks", lastly changed in 2004 in the training course E-learning and integrating learning.

Another training course in distance learning launched by Galliani was that in "Evaluation and quality of schooling and educational institutions", to which were then added Philosophy for Children, 2003-2004 (Santi, 2005), Leadership and Management of learning activities (Di Nubila & Giuffrida, 2005) and Per la formazione del bibliotecario (Librarian training) (1999-2000). This latter represents very well the transition from the second to the third generation of distance learning.

In its first edition (1999-2000), although the interaction would take place through many means such a website, e-mail, forum, texts and other educational materials that were delivered on hard copy by mail.

Nevertheless, tarting from the following year we note a turning point leading towards e-learning. Among the master degrees linked to e-learning we can also mention those in Audio-visual and Multimedia Education (Luciani, 2005), Planning and managing cooperation and education activities in Middle Eastern Europe and in the Balkans (Santonocito, 2005) and Tutoring in Distance Learning (Nadin, 2005).

Another interesting example goes back to the year 2003-2004 when the course in Distance learning Technologies in blended mode took place (Costa & Dal Bon, 2005, p. 133) for the degree course in Social Organization Trainer, a test bench for the e-learning implementation also in other degree courses. We would also like to recall here the experience of Online Stage (Felisatti & Tonegato, 2015) experimented in Early Years and Primary Educational Sciences.

The attention paid to e-learning is such, that a platform initially called Chirone was planned (Manfredi & De Wall, 2005), and was then replaced by Moodle.

The University of Padua was also among the first Universities to experiment many technical solutions, platforms and entirely online modalities and blended courses, part in presence part online, and the use of free platform instead of the branded ones.

THE UNIVERSITY OF VERONA

Among the first Universities that experimented the e-learning at the beginning of 2000 we mention here also Verona and, in particular, the project Elvira (E-Learning a Verona In Rete di Ateneo) which would include a spectrum of experimentations (Bianco, 2005) implemented throughout the decade 1995-2005 and that embrace 4 sectors: 1) distance learning on the web and cooperative learning; 2) cooperative learning on the web combined to traditional learning in presence (blended learning); distance learning by conference calls and traditional classes; 4) distance learning by audio-visual records suitable in streaming (Scollo et al., 2005).

Verona chose to focus on heterogeneous technic and the max accessibility, and on service integration and interoperations for graduated and under-graduated students and for lifelong learning. Among such initiatives we also mention some master degrees for foreign students, for example in Argentina.

THE UNIVERSITY OF FERRARA

In Ferrara the idea of distance learning first appeared in 1995 and was inducted by the researches of Università Roma Tre, managed by Benedetto Vertecchi, and by a project of professional distance reconversion of Prijmo Magri, funded by the Ministry of the Public Education.

The University had already founded in 1998 the centre Carid (Centro di Ateneo per la Ricerca, l'Innovazione Didattica e l'Istruzione a Distanza), directed since 2000 by Paolo Frignani, lab technician and Piaget's documentarist highly experienced in the audio-visual sector and its relationship with pedagogy. Carid is an excellence centre "pioneer in planning and implementing degree courses in distance learning, integrated by full-immersion dedicated sessions in presence" (http://stum.unife.it).

Among the most successful activities of Carid we hereby mention the implementation of the degree course in Technician in audio-visual communication and multimedia and the master degree in distance learning in non-profit Economy and Development Cooperation (https://lists.peacelink.it/volontariato/2005/02/msg00041.html).

In the theoretical sector Carid focused on many issues: didactical and distance learning issues, the new teacher's role, the diversification among system tutor, content tutor and content expert and evaluation expert, learning objects creation in diverse media, the concept of knowledge organization, managing tools of the information flows on the net, docimological analysis applied to the quality evaluation in the theoretical and evaluative aspects.

THE CONSORTIA: NETTUNO, ICON AND FOR.COM

The consortium Nettuno, launched in 1991, embodies the transition of distance learning from second to third generation. Among the founding shareholders there were the Politecnico of Milan and Turin, University of Napoli "Federico II", and then other Universities joined and also RAI, Confindustria, IRI and Telecom Italia; it delivered courses in videotapes and television channels both terrestrial and satellite channel and internet (Fiorentini, 2003)
Another consortium worth being mentioned is Icon (Italian Culture On the Net) that includes many Italian Universities with the scope of enhancing Italian language and culture through e-learning.

Born in 1999, Icon is affiliated to the Ministry of Foreign Affairs and is active in 80 countries from all over the world. The Universities in the consortium are Bologna, Catania, Genova, Milano Statale, Napoli l'Orientale, Padova, Parma, Pisa, Roma Tor Vergata, Roma Tre, Salerno, Torino, Venezia and the two Universities for foreigners in Siena and Perugia.

Icon offers since 2001 the degree course online in Italian Language and culture for foreigners, in addition to masters and professional trainings and language courses.

Since 1990 in Roma La Sapienza and Bournemouth Polytechnic (UK) had established the consortium For.com that delivers degree courses, masters, professional trainings, specializations. We also recall here the project "Icaro 2000" and "Dedalo", meant for trainings delivered on internet on didactical application of multimedia.

OTHER UNIVERSITIES IN THE NORTH

In Turin in the project Comunico we recall a semestral course in Theories and technics of new media for the degree course in Communication Sciences with a "website and computer conferencing for communications among students, teachers and tutors" (Fiorentini, 2003, p. 17).

At the University of Ca' Foscari in Venice the course Pedagogy 2000 for the degree course of Literature, Languages and Philosophy was launched. The web platform allowed the publication of learning materials (among which the hypertext *Storia del metodo*), the calendar, synchronic and asynchronous communication among teachers, students and tutors. On the university platform there were also online courses such ad online Chemistry 2000 and Didachem online 2000 (Fiorentini, 2003).

In Udine, starting from 2002/2003 the Faculty of Foreign Languages and Literatures opened the undergraduate course in Online Public Relations (Bombi, 2009), starting point for other experimentations in mixed didactic.

In 2004 Macerata established the Celfi "Centro per l'E-Learning e la Formazione Integrata" (Bittarelli & Rossi, 2010; Rossi et al., 2005), managed by Pier Giuseppe Rossi, that grounded relationships with the University in Zurich and created the open source Olat and won the prize Unique Quality in ICT and e-learning in 2009.

Before Celfi Macerata had Caim (Centro di Ateneo per l'Informatica e la Multimedialità). In 2007 Ciem was established "Centro di servizio per l'Informatica l'E-learning e la Multimedialità" that merged Celfi and Caim. The Macerata platform slowly passed from a web 1.0 to 2.0 gaining a wider democracy.

Other centres are the Centro Universitario per l'Informatica and Telematica Q.it of Siena, Cesmi (Centro Servizi Multimediali e Informatici) of Università politecnica delle Marche, Citam "Centro Interfacoltà per le *Tecnologie* Didattico-Educative Teleaudiovisive" G. Marconi of University of Bologna.

ROME

In 1999 Tor Vergata, moving from the experience of CoFoDi "Comitato Formazione a Distanza" (1996-1999) established the LaD (La scuola Digitale, The Digital School), and delivered a degree course in Educational and teaching Sciences in a multicultural society in addition to many masters and specialization courses and for the certification of ECDL (Fiorentini, 2003).

From the end of '80 the experimental pedagogy workshop of Roma 3 (Domenici, 2017) experimented the distance learning and this experience evolved throughout the years (Agrusti, 2007). An example is the workshop of Introduction of experimental research started from 2003 (Poce, 2003). In the last years the "Fondazione Università degli Studi Roma TrE-Education" has the scope of managing, developing and enhancing for the University of Roma Tre the technical, administrative services and support services for learning, teaching and professional development, especially in e-learning".

THE SOUTH

In the South, despite the digital divide and the severe infrastructural backwardness and the minor mediatic appeal, e-learning experimentations with diverse exits did take place. The University of Napoli Federico II created one of the most important platforms Mooc: Federica. Also before that Cds (Centro di Ateneo per i Servizi informativi) and SOF-Tel (Centro di Ateneo per l'Orientamento, la Formazione e la Teledidattica con corsi multimediali informatici e linguistici) were operating. The second University of Neaples instead would count on Crisceb (Centro di Ricerca in Scienze Computazionali e Biotecnologiche). In Bari in 1996 the Centro interfacoltà Rete Puglia has been launched, with the scope of implementing the distance learning at the Athenaeum and in the other University in Puglia.

Starting from that period three experimental projects were implemented: Rete Puglia, Proteo and Score (Campanella et al., 2008a and 2008b).

The consortiated project Italis (Istruzione a distanza per l'Apprendimento della Lingua Italiana come lingua Straniera) of the University of Calabria (Calabrò et al., 2004), funded for the years 1997-2000 by the European Commission in the context of the program SOCRATES/LINGUA, led to the experimentation of a support system for learning Italian as a foreign language.

In the consortium many institutions were included such as Cirrmi (Centro di Formazione continua degli insegnanti italiani – Université La Sorbonne Nouvelle, Paris III, France), Tesi S.p.A. (Tecnologie e Servizi per l'Innovazione, Italia), Dipartimento di Linguistica dell'Università della Calabria and Centro Opacon della Calabria.

2003: THE LAW STANCA AND THE TELEMATIC UNIVERSITIES

For e-learning has been crucial the decree of 1//04/2003 that legitimates e-learning in the public athenaea and in the private ones. The so called "legge Stanca" (law Stanca) by the surname of the Ministry for innovation and technologies juridically defines distance learning courses (art.2) and "criteria and requirements for distance learning courses accreditation in the state and non-state Universities and in the institutions qualified to issue academical titles" (art.4).

The decree marks the beginning of the history of the private telematic universities (http://unitelematiche.it/storia-universita-telematiche-italiane) that since 2003 would flourish in the entire Italy. The first was in March 2004 the university Guglielmo Marconi based in Rome.

A couple of months afterwards, in May 2004, the telematic University TELMA was born and then, in 2010, it was renamed Unitelma Sapienza: the majority shareholder in the consortium was Roma La Sapienza.

In October 2004 the University of Gabriele D'Annunzio in Chieti and the Ud'A Foundation (Fondazione Università Gabriele D'Annunzio) and the University of Leonardo da Vinci, also called Unidav. In April 2005 the Uninettuno International Telematic University was institutionalised, generated by the Eu project MedNetU (Mediterranean Network of Universities) coordinated by the consortium Nettuno itself, made up of 34 Italian and Foreign Universities and among the founding members Maria Amata Garito (2012 and 2013).

On the 2nd of December 2005 it is the turn of IUL "Italian University Line" based in Florence. In 2006 there is explosion od new telematic universities: on the 13th of April, the Giustino Fortunato of Benevento, rewarded with the quality certificate in 2010; on the 20th Pegaso, based in Napoli, founded by Danilo Iervolino (2015) owner of the homonymous Institutions for school remedial courses; on the 8th of May the Unitel, nowadays Telematic University of San Raffaele Roma; on the 10th of May the Nicolò Cusano that, getting inspiration from the Anglo-Saxon model, created a big campus by the central headquarters in Rome; on the 2nd of June 2006 the Università Mercatorum based in Rome and wanted by the System of the Italian Commercial Chambers and specialized in the economic sector.

TOWARDS THE MOOC ERA

At the middle of the years '0 of the new millennium e-learning became a well consolidated reality in the Universities as testified among the other evidences by the foundation exactly in 2004 of the no-profit association Italian e-learning society.

In a five-year period since the beginning of the millennium almost every athenaeum would benefit from e-learning equipment, even if there are little cases of real success and the distance learning of new generation is less widespread than in the other EU countries. The trust in e-learning is also meagre with respect to the trust given abroad. As Bianco recalls (2005, p. 61), the situation in 2005 is the following:

"Circa il 72% degli Atenei (in tutto, 79 tra Università e Istituti parificati di Alta Formazione) è impegnato in iniziative di on-line ma di questo solo il 7% circa (5 Atenei) è caratterizzato da un'offerta a regime, mentre il rimanente 65% ha sperimentazioni di nicchia. Il 28% degli Atenei (cioè 22 su 79) non ha mai intrapreso sperimentazioni di on-line.".

Those years represent the sunrise of a new revolution that would change e-learning history. About at the end of the '0 in fact, the interest into open didactic resources OER (Open Educational Resources) would rise.

In 2008 in America Mooc (Massive Open Online Courses) phenomenon appeared, i. e. mass free-of-cost online courses that allow for the first time anyone to benefit from distance learning at academic level. The birth date of Mooc (Pozzi & Conole, 2014; Fontanin & Pantò, 2019) relates to the famous course Connectivism and connective knowledge (CCK08) of the University of Manitoba where two Canadian Professors, George Siemens and Stephen Downes, for the first time made available for free their course. The word Mooc was coined by another Canadian researcher, Prince Edward Island, who named the course CCK08 under this acronym. From the USA the Mooc revolution spread also in Europe and in Italy, where the first Mooc Platforms were created among which Federica of the University of Naples and Eduopen, the first Mooc consortium that counted among its leaders the University of Foggia along with other 8 Italian athenaea (2015; Limone, 2016). Despite some doubts and concerns, this new reality projected e-learning towards a new dimension where learning gains a real global perspective.

In the first years of the new millennium the semantic web began to be developed: it is a milestone also in the e-learning field, since it allows a new personalisation of online learning and a more flexible and interoperating use of web resources and learning objects to enhance e-learning and students' objectives (Ouf et al., 2017).

JASON'S MYTH AND E-LEARNING DESTINY

Nicola Paparella (2005) suggests an effective analogy to describe the behaviour concerning e-learning and its destiny at the end of the '90 and the beginning of the new Millennium: e-learning development and the Dante's character of Jason, explained in an article titled *Il mito di Giasone e il destino dell'e-learning in Italia*.

As the author explains, the character of Dantes' Jason is that better represents the conduct of the Bel Paese with respect to e-learning: "A Dante […] il Giasone del mito piaceva e non per motivi diversi da quelli che ci inducono a pensare proprio a Giasone mentre discutiamo del destino dell'e-learning in Italia" (Paparella, 2015, p. 22). (Dante liked Jason's myth and not for reasons that differ from those that make us think exactly to Jason while we are discussing e-learning destiny in Italy).

Dante puts Jason in the VIII circle, that of pimps and seducers thus, he mentioned him in the XVIII of *Inferno* (vv. 86-87), where the poet recalls the conquest of the golden fleece in the Colchide.

Quelli è Iasón che per cuore e per senno
li Colchi del monton privati féne.

Despite the mythical adventure, Jason is put in the circle of pimps and seducers because he seduced Isifile in Lemnos and then also Medea. His character is regal despite the demons' whips and it is his noble figure that attracts Dante's attention.
In particular, Paparella dwells on this scene and quotes some verses from the *Paradiso* II 16-18:

Que' gloriosi che passaro al Colco
non s'ammiraron come voi farete,
quando Iasón vider fatto bifolco.

Here, talking to the readers, Dante explains the wonder of whom, after an in deep study, will read the *Paradiso* recalling the wonder of the Argonauts when they saw Jason subduing the terrible bulls to plough the field.

The pedagogist quotes also vv. 94-96 of *Paradiso* XXXIII, the latter of the poem, where Dante compares the divine vision to Neptune's wonder when he saw the Argo ship and compares his oblivion of this vision to the 25 centuries passed since Jason's venture.

Un punto solo m'è maggior letargo
che venticinque secoli a la 'mpresa,
che fé Nettuno ammirar l'ombra d'Argo.

In Paparella's opinion, e-learning history in Italy can be compared to these mythical hero's wonder ventures, whom the fate puts to the test and with diverse events: initially it was believed that it was a panacea and a miraculous tool but then deep doubts and refusals to cope with soon followed.

Like Jason succeed in conquering the golden fleece but then faced a bad fate, the first distance learning experiments of first generation in America and the experimentations in Italy of distance learning of second and third generation between the years '60 and '90, three crucial questions arose in the public opinion.

These questions were: are we sure of online courses effectiveness? Don't you think that we are taking something away from the youth, like for example the human interaction? What is the best way of e-learning, synchronic or asynchronous?
These questions and a growing distrust about e-learning slowed its diffusion in Italy. That is why, as Paparella explains, that in the '90 it was decided to adopt the typical model of synchronic communication of remote classes instead of exploring the more revolutionary possibilities of e-learning, getting inspiration from Uninettuno (Garito, 2013).

Therefore, it was chosen a TV didactic without bidirectionality and interactivity, focusing on satellite broadcasting more than on the "lesson digital elaboration", delivering videotapes and fossilizing in distance learning of second generation. Like Jason attacked the harpies that would block the old wiseman from eating and reveal where the golden fleece was, in the same way old theories should have been swept away and resistances so that e-learning could find its own way in a new didactic paradigm useful both to distance and in presence learning.

CONCLUSIONS

In the e-learning history, the decade between the two millennia marked the definitive start of third generation distance learning in some excellence campuses and in almost each Italian athenaeum.

University e-learning has changed from an option dedicated to special categories of students like working or disable students to a new frontier largely to be yet discovered, open not only to the entire students' community.

Many centres born in the traditional universities and with the purpose of experimenting the new methodology and ICT in learning contributed to the didactic innovation.

In the decade 1995-2005 academic centres dedicated to distance learning and then e-learning and promoted didactic renovation flourished.

In 2003 the law Stanca institutionalised e-learning legitimating an alternative that in 2020, due to the coronavirus, became the only possible way.

Despite the resistances, the incertitude regarding the pedagogical models to be implemented and the doubts about e-learning fate, this decade has been crucial for the distance learning and grounded its future development which was enormously enhanced in these months of health emergency.

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Social Media Generations' Levels of Acceptance of Diversity[1]

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ABSTRACT
Social media networks offering the opportunity of communication on a global scale help individual of any age to build their own worlds as part of participatory online culture. The intense use of social media networks and the global affection power on public opinion lead the researchers to investigate the effects of social media networks on Baby Boomer, X, Y, Z generations. So, the levels of acceptance of diversity of these generations are investigated in "Acceptance of Diverse Religions/Ethnicities" and "Acceptance of Diverse Appearances" and "Acceptance of Diverse Ideas/Values" dimensions of "Acceptance of Diversity Scale" developed by Deniz and Tutgun - Ünal (2019). The research was carried out in a general survey model and the sample of the research consisted of 516 individuals of different generations. Some of the major results are as follows: (a) The levels of acceptance of diversity of generations are moderate level; (b) Females' levels of acceptance of diversity are found higher than males; (c) Levels of acceptance of diversity of those using social media for a longer time are higher than those using for a shorter time; (d) Those using social media more than four hours daily have a higher level of acceptance of diverse appearances; (e) The generation Y has the highest tolerance level of the acceptance of diverse appearances whereas generation Z has the lowest tolerance level.
Keywords: Social media, Social network, Generations, Acceptance of diversity, Scale

INTRODUCTION

In today's world, where the rapidly growing widespread use of social media prevails, generations and the transfer of values have changed dimensions, causing the networks' influence and reflections to transform every field. People are now able to communicate globally with small-sized devices such as smartphones and watches via an internet connection and live a life as part of the online world separate from the real world.

The unique nature of the online world and its inclusion of different forms of communication have exposed the societies and generations it contains to different effects, making it necessary to re-question the transfer of values and behaviors and the communication of generations. According to Morsümbül (2014), understanding a society requires understanding values since it is the guiding element that forms the basis of the generations and social norms which build the society. Behaviors that occur in line with values change with factors such as socialization experiences, faith, personal characteristics, and family life of each individual. In today's society, the global interaction of social media networks that affect the transfer of value in a way has established various togetherness and revealed cultural diversity.

The dominant culture is the participatory culture today. In this culture, a person cares about what other people think about his/her behavior. In social networks, people are curious about what each other is doing and they produce content on various topics with many purposes to be liked. In this respect, social media networks point to online society as a virtual environment model of participatory culture. Nowadays, participatory culture has changed direction with the online togetherness, and the interaction which is established with various online social forms has led to the differentiation of intergenerational communication and value transfer (Akyazı and Tutgun-Ünal, 2013).

When the generation studies around the world are examined, it is seen that the generations are examined by grouping. These groups are named as Silent Generation (1927-1945), Baby Boomer (1946-1964), Generation X (1965-1979), Generation Y (1980-1999), and Generation Z (2000 and later). However, generations in similar years may appear with different names in other studies. (Berkup, 2014; Census, 2006:2; Dewanti and Indrajit, 2018; Ekşili and Antalyalı, 2017; Johnson and Johnson, 2010:7; Toruntay, 2011; Tutgun-Ünal, 2013; Tutgun-Ünal and Deniz, 2020; Zemke et al., 2013:24).
When the literature is examined, it is seen that different generations show different characteristics in the adaptation to work-life, technology, and even life. Thus, it is important to consider the conditions of the period in the research

[1] A summary of this research was presented in the IV. International Social Research and Behavioral Sciences Symposium organised at Antalya Akev University between 19-21 October 2019.

which focuses on understanding the generations that use social media. As such, it is stated that technology was not common in the period of the Baby Boomer generation who were born between the years of 1946 and 1964, therefore they had to do and produce their own work. People born in this period are respectful to authority, have a high job loyalty, and are conventional. When we consider the relationship of technology and the Generation X who were born between the years of 1965 and 1979, the tools that they have used back then such as the wringer washer, transistor radio, cassette player are now almost disappeared and thought to be nostalgic. Thus, with the widespread use of computer systems, transformations have been experienced in many areas and making them necessary to adapt to changing ways of doing business. It is observed that Baby Boomer Generation and Generation X, who later met with computer systems, are now coming together and socializing with younger generations on social media networks (Tutgun-Ünal, 2013).

Considering Generations Y and Z, it is seen that Generation Y, involving the people born between the years of 1980 and 1999, is the generation in which the differences are felt most clearly (Ekşili and Antalyalı, 2017; Latif and Serbest, 2014; Tutgun-Ünal, 2013). Generation Y, who were introduced to technology at an earlier age compared to other generations, have high self-esteem, are impatient in work life, and insist on their ideas. On the other hand, the most important feature that distinguishes Generation Z, which includes those born in 2000 and after, from other generations is that they were born at a time when information technologies and social media were widely used. According to the Turkey Statistical Institute (TUIK)'s data, the ratio of the youth between the ages of 15-19, who are in Generation Z and born after 2000, to the total population has reached approximately 13%; and the ratio of the generation between the ages of 20-39, who are in the Generation Y and born after 1980, to the total population reached approximately to 32% (TÜİK, 2018). This high rate of Generations Y and Z, reaching 45% in total, has led many researchers to engage in intergenerational studies (Deniz and Tutgun-Ünal, 2019; Borges-Rey, 2015; Boomsocial, 2019; Ekşili and Antalyalı, 2017; Morsümbül, 2014; Tutgun-Ünal and Deniz, 2020).

The researchers aimed to understand and reveal the differences of Generations Y and Z's experiences and expectations in areas such as work, family, and education life due to the intensive social media usage time (Akdemir et al., 2013; Ekşili and Antalyalı, 2017; İnce, 2018; Latif and Serbest, 2014; Mücevher, 2015; Taş, Demirdöğmez and Küçükoğlu, 2017; Tutgun-Ünal, 2013). On the other hand, a wide range of evaluations are also made, including the development characteristics of the country, the impact of gender on work life with industrialization, and education/training conditions when generation characteristics are investigated (Kesgin, 2018; Tutar, 2020a; 2020b; Tutgun-Ünal, 2019). Studies have emphasized that there are intergenerational similarities as well as differences, so generations should be addressed from this aspect as well. (Ekşili and Antalyalı, 2017; Özdemir, 2017; Toruntay, 2011; Tutgun-Ünal, 2013).

Generations were compared in terms of the basic values such as "Openness to Change", "Conservatism", "Self-Empowerment" and "Self-Transcendence" in the study of Morsümbül (2014) based on the value approach of Schwartz (1992, 1994). As a result of the research, in which the transformation of intergenerational cultural values between three generations was questioned in the Ankara sample, it was determined that the transformation of values between generations was not fast, but that great changes could occur in the long run. Further, it was emphasized that knowing and acting according to the intergenerational differences could be effective in solving the problems. In this context, considering the speed of information dissemination in social media networks and the power of influence of the networks, the potential to make great changes in a short time has transformed the ways of understanding the value transfer.

Christakis and Fowler (2012) suggested in their study of the influencing power of social networks that online networks have up to three degrees of the power to influence emotions. Accordingly, emotions in social networks affect the people in the network up to three degrees. Mathematical analysis of the social networks they made showed that the likelihood of a person being happy increases 15% when someone from one degree away is happy, 10% when someone from two degrees away (friend of a friend), and %6 when someone from three degrees away (friend of a friend of a friend). If it is four degrees away, the effect diminishes. Thus, as a person's network in social media expands, the power of influence also increases, and it is seen that especially three degrees of influence intensify.

The fact that social networks enabling global communication has paved the way for the formation of mosaic structures around the world by providing an environment for interaction with people of different cultures, beliefs, appearances, and values. Thus, it has been wondered how the online mosaic structures will reflect on the society in real daily life and how they will affect the communication and behavior forms in various areas. In this respect, the degree to which the social media generations accept people with different religious beliefs and cultures, different appearances, and even different opinions becomes very important in understanding social cohesion. Only

with the description of the current situation the direction of expectations, understanding, and communication between generations become clear.

In the global world, changes spread rapidly through social networks, exposing generations to different effects. To İçli (2001), globalization causes an increase in the movement of goods and people around the world and a rapid change in the cultural processes. According to this, while "national" had a privileged position in modernity, it seems to have lost this position in the globalization process, and the social relations that had taken place in the national time and space have now moved to the times and places where differences are emphasized. New communication networks and cultural flows take place rapidly through symbols such as moving and/or still images. The most obvious example of this is the social media networks known for their popularity today, by allowing different cultures to be met and seen side by side.

Today, it is seen that the high-speed social change that occurs with the effect of many factors such as technology, economy, and social events creates an intense interaction between cultures and affects all generations by spreading on a global scale through online networks. In this context, some characteristics that are stated to be evident for generations and the extent to which the differences created by global interaction affect generations at regular intervals are reconsidered, thereby generations will be better understood and social cohesion will be ensured as a natural result of this.

Thus, "levels of social media generations' acceptance of diversity" was determined as the problem statement in this study. Concordantly, it is important to compare the levels of acceptance of diverse religions/ethnicities, diverse appearances and diverse ideas in terms of generations, and to reveal how values and behaviors are transformed by the effect of social media.

The Conceptual Framework of Diversity

The technological changes in the world have recently made the concept of diversity gain importance. Because people with diverse identities coming from different cultures and countries are more intertwined than before and the studies on the subject are increasing as they approach today. When we look at the etymological origin of the concept, we see that it comes from the Arabic root as "frk" and is associated with the words of "separation", "dissociation", "distinction", and "differentiation" (Turkish Etymological Dictionary, 2021).

There must be two or more things in the subject being evaluated for a difference to occur. When the literature is examined, differences are observed even in the conceptual definition and types of differences. Sonnenschein states that differences are defined as "differences between people in terms of race, culture, gender, sexual orientation, age and physical abilities", but the differences have various dimensions such as ethnic origin, national origin, class, religion, education and communication style, place of birth and occupation (Sonnenschein, 1997:3). Supporting the definition, Resources also says that differences mean more than race and gender (Human Resources, 2003; 43). In the field of philosophy, the concept of difference is defined as "the feature that distinguishes every natural, social and conscious event and phenomenon from all others" (http://www.tdk.org.tr). Looking at the differences objectively, we see that people have a series of physical and cultural differences that make up the "range of differences". From a subjective point of view, difference or being different is attributed to other individuals or groups that are different from the individuals themselves or the groups they belong to (Loden and Rosener, 1991,18).

Most people see differences as negativities that should be avoided. However, differences should be considered as the emergence of personal talents and opportunities that help the individual to establish healthy relationships with others. As it is not possible to ignore the differences in terms of businesses, what needs to be done is to think about how differences can be managed (Budak, 2008:398-400). The Society for Human Resource Management in the USA, which has conducted studies towards managing diversity, stated that diversity is often used to express differences based on ethnicity, gender, age, religion, disability, national origin, and sexual orientation according to human resources professionals. Further, it covers an unlimited range of unique features and experiences such as communication styles, speed of learning and understanding, and physical characteristics such as height and weight, (Robbins and Coulter, 2012).

One of the first things that come to mind when talking about the concept of difference is the concept of "identity". It can be seen with various names in the literature. The identity reflects how a person defines and positions himself/herself in the social world, who he/she is, and where he/she stands. The definition of identity, which can be defined as "the whole of the characteristics of an individual or group that differ from other individuals or groups", is always made according to an "other". In other words, definition of identity "passes from the other, through the other" (Bilgin, 2003:199). It should be emphasized that each identity includes an exclusion mechanism.

Each identity has to be defined by its opposite. Making a common identity definition always requires the existence of those who are not included in this identity (Kılıçbay, 2003). The most effective factor in the formation of an identity is family. Family structure, on the other hand, differs with many factors. Parallel to these differences in family structure, there are also differences among individuals who form families. Each family has a certain income status, a cultural structure, the educational status of the members of the family, their living standards, and the types of the profession they have that provide their livelihoods may also differ from each other (KEDV 2006). These diversities directly affect the individual's perspective on differences because the individual starts to get to know the world within his/her family first. Following the family, school life and social environments are effective in the formation of the personality of the individual. This emerging personality directly affects tolerance towards differences or not recognizing differences.

Tarhan (2020a) defines the family as the cornerstone of society and emphasizes the need for families to receive awareness training by experts because only a conscious family will be able to nurse their children emotionally and provide a suitable peaceful growing environment for them. According to Tarhan (2020b), the *5S* model is needed for the development of trust. These are: Love, Respect, Patience, Loyalty and Sincerity *(Sevgi, Saygı, Sabır, Sadakat, Samimiyet)*. The trust-based communication environment provided within the family affects tolerance to differences.

Cultural differences highlight many differences among social situations. In the literature review, various surveys were seen for cultural differences and there are many models for this difference. According to the literature reviews, cultural differences can be classified under the following main headings.

Universalism and Specialism: Culture dominates in universalist culture; rules determine everything. Everyone must obey the rules. It is widely believed that once the rules are not followed, the system will collapse. In a significant part of Eastern societies, specialism is more dominant.

Collectivism and Individualism: Collectivistic culture sees the group as a goal and accepts the development of individuals as a means of achieving this goal. According to the individualistic culture, the goal is the "individual"; developments in the community order are tools that serve the individual. Individualism is generally accepted as a feature of a modernizing society. It took centuries for a person to emerge as an individual from the community that surrounds him/her.

Plain and Emotional: Members of emotionally plain cultures do not reflect their emotions and they carefully control them. This does not mean that they are cold or unfeeling. In these cultures, calmness and self-control is admirable. On the other hand, a member of an emotional culture expresses his/her feelings instantly by laughing, smiling, sulking, and displaying gestures. Transparency and expressing emotions reduce tensions. Warm, lively, and uplifting expressions are admired in these cultures.

Detailed and Specific: Everything is interconnected with each other in detailed cultures. However, indirect and winding ways are used when establishing relationships between people. There is a morality that changes according to the person and the situation. In detailed cultures, people's public living space and private living space are intertwined. Whereas in specific cultures, people's public living space and private living space are separated from each other. Direct and goal-oriented relationships are established. There is a moral understanding based on principles and independent of the person addressed.

Recognition by Gaining Status: In all societies, some members are assigned a higher status than others. However, in some societies, people gain their status based on what they do, their efforts, and achievements. In some societies, status is given to people for reasons such as age, family, gender, education. In acquisitive cultures, a title is earned to the extent of the contribution made to the job or the society in which the people are evaluated according to their knowledge and skills. In recognizing cultures, titles are the indicators of status and are widely used. The respect shown to managers, chiefs, and chairmen is seen as a measure of commitment to the group or organization.

According to Time View: Only human beings have the concept of time in the living world. History, family, ethnic/national origins are of great importance in past-oriented cultures. On the other hand, the activities and tastes of the present moment in time come to the fore in present-oriented cultures. Plans are not challenged, but rarely implemented. Everything is viewed in terms of its current effect. However, opportunities and potentials are emphasized in future-oriented cultures. There is great interest in youth and their future potential. Past and present times are evaluated in terms of future benefits.

Way of Thinking: Cultures also differ in whether people who think simultaneously or in order (consecutively) of all time. In sequential cultures, there is only one activity at a time. Relationships depend on the calendar; the time of the appointments is fixed. The tendency towards following the initial plan is strong. In cultures that think simultaneously, more than one activity is carried out at the same time. Calendars are usually organized by relationships.

According to Environmental View: There is also a difference between the cultures in terms approaching the environment. In some cultures, success is associated with the control over external conditions and they are internally oriented. In other words, they have a strong belief that they can impose their will on nature and their environment. A dominance attitude prevails based on the concept of environmental aggression. Their focus is on their own existence, functions, and organizations. They feel uncomfortable when the environment seems out of control. Whereas in some cultures, there is a strong belief that human beings are a part of the environment and that they should adapt themselves to the laws and forces ofnature. Here, a flexible attitude, compromise, and peace are essential, and harmony, understanding, and sensitivity are valued. The focus is not “me” but the “other”. Waves and changes are welcomed to the extent that they are natural (Aksu 2008, from Dicleli and Akkam).

People's need to believe is seen in all historical ages. But in today's societies, differences in religious terms represent social differences in general and one of the differences in society in particular. From a social perspective, religion is a superstructure institution that affects traditional rules and practices of individuals. "Religious Orientation" can be defined as the expression of an individual's evaluation of a religion, to any degree or not. That is, the religious orientation is the psychological orientation of a person regarding religion and his/her world of belief. All kinds of reactions that express an individual's assessment of religion are an indicator of one's religious orientation. When religious orientation is considered together with the understanding of God and the afterdeath in religions, three important factors come to the fore: religious thought and belief, religious behavior-worship, and one's feelings and expectation of future outcome in relation to these two factors (Kuzgun and Sevim, 2004).

Barutçugil (2011:46) stated that the dimensions of diversities can be explained separately at the levels of individual, society, group, and organization. According to Barutçugil, the dimensions of diversities cause the reflection of the differentiating characteristics of each level in people living at all four levels. People who are different individually also have the characteristics of the societies, groups, and organizations they are a member of. As the status, position, and relations of the individual in social structure and communities increase, the dimensions of diversities also differ.

The Purpose of Research

The aim of the study was to examine social media generations’ levels of acceptance of diversity in terms of various variables. For this purpose, the following research questions were sought.

1. What is the level of social media generations’ acceptance of diversity?
2. Does the social media generations’ acceptance of diversity differ?
3. Does the social media generations’ acceptance of diversity differ according to gender?
4. Does the social media generations’ acceptance of diversity differ according to daily usage of social media usage?
5. Does the social media generations’ acceptance of diversity differ based on the onset of social media usage?

METHOD

Since the study aims to analyze the social media generations’ levels of acceptance of diversity in terms of various variables, the general screening model was used for revealing the existing situation. According to Karasar (2018), general screening models are used to reveal the existing situation in a universe containing a large number of elements.

Research Group

The sample consisted of 516 participants, 57% of whom were women (n:294) and 43% of men (n:222), who were considered to be in different generations. Thus, the sample was determined through appropriate (accessible) sampling. According to this, 5.8% of the participants were the Baby Boomer Generation (n:30) born between the years of 1946-1964, 6.6% was the Generation X (n:34) born between the years of 1965-1979, 35.5% was the Generation Y (n:183) born between the years of 1980-1999, and 52.1% was the Generation Z (n:269) born between the years of 2000-2020.

Furthermore, 395 people (76.6%) of the sample are groups who are still students. The proportion of Generation Z participants who are still studying at secondary school is 54.2%. The rate of high school students is 14.4%, 17.7%

of undergraduate students, the rate of graduate students is 9.4%, and the rate of doctoral students is 1.3%. When the last schools that they graduated were questioned, 45.5% of the sample have an undergraduate degree, 16.5% high school diploma, 12.4% graduate degree, 11.6% doctorate degree, 8.3% of them are graduates of college, 4.1% a have secondary school diploma, and 1.7% have primary school diploma.

Data Collection Tools

In the research, data were collected with the "Acceptance of Diversity Scale (ADS)" which is developed by Deniz and Tutgun-Ünal (2019). ADS consists of two three subscales, namely "Acceptance of Diverse Religions/Ethnicities", "Acceptance of Diverse Appearances" and "Acceptance of Diverse Ideas/Values". Acceptance of Diversity Scale includes people's acceptance and prejudices towards diverse religious/ethnic structures, diverse appearances, ideas and life values in the work and family environments.

The 1st and 3rd items that are located in the ADS's Acceptance of Diverse Religions/Ethnicities subscale and all items in the Acceptance of Diverse Appearances and Acceptance of Diverse Ideas/Values subscales should be scored in reverse. Obtaining high scores from these subscales reveal more accepted diversities (Deniz and Tutgun-Ünal, 2019).

The 1st, 2nd and 3rd items of the ADS which were included in Annex-1 measure "Acceptance of Diverse Religions/Ethnicities"; 4th, 5^{th,} and 6th items measure "Acceptance of Diverse Appearances"; and 7th, 8th, and 9th items measure "Acceptance of Diverse Ideas/Values" dimensions. ADS is a 5-point Likert type scale and the participation in the items was organized with the options of "never", "rarely", "sometimes", "often", and "always". The Cronbach α internal consistency coefficient was 0.77 in the total of the scale.

The data of the participants such as birth year, gender, daily social media usage time, and how long they have been using social media were also collected by an information form organized by the researchers in the study.

Data Collection and Analysis

In the research, the data were collected from the generations available in accordance with the principle of volunteering. In order to fill out the questionnaire form, an average of 15 minutes was sufficient. Data collection was carried out in 5 weeks.

Levels of acceptance of diversities are graded as "low", "moderate", and "high" by dividing the range into 3 by obtaining the lowest score and the highest score from each item of the ADS. For the subscales, the related items were also graded in the same way, and "Acceptance of Diverse Religions/Ethnicities", "Acceptance of Diverse Appearances" and "Acceptance of Diverse Ideas/Values" values were set (Table 1).

Table 1. Ranges of Acceptance Levels of Diversity Scores

Acceptance of Diverse Religions/Ethnicities	Acceptance of Diverse Appearances	Acceptance of Diverse Ideas/Values	Acceptance of Diversity Scale	Level
3-7	3-7	3-7	9-21	Low
8-11	8-11	8-11	22-33	Moderate
12-15	12-15	12-15	34-45	High

To analyze the data SPSS 22 statistics program was used by implementing various techniques such as frequency tests, t-test, and variance analysis.

FINDINGS

In this part of the study, the acceptance levels of diversity of 516 participants consisting of the X, Y, Z, and Baby Boomer generations were statistically examined in the light of the research questions by applying the ADS.

Results regarding the social media generations' acceptance levels of diversity

Firstly, to determine the social media generations' level of acceptance of diversity, analyses were made in line with the scores obtained from the total of ADS and subscales which are given in Table 2. Accordingly, the social media generations' levels of acceptance of diversity were found to be moderate.

Table 2. Generations' Acceptance Levels of Diversity

Sub-scale/Scale	n	$\underline{X}$	sd
Acceptance of Diverse Religions/Ethnicities	516	11,62	3,06
Acceptance of Diverse Appearances	516	11,11	3,30
Acceptance of Diverse Ideas/Values	516	9,87	2,30
ADS	516	32,61	6,23

While the lowest score that can be obtained from the ADS is 9, the highest score is 45, and the in-between scores are divided into three values as "low", "moderate", and "high". Accordingly, a score of 32.61 received by social media generations shows that there is a moderate acceptance tolerance for diversity.

When the subscales are considered, it is seen that each subscale consists of three items and the lowest possible score is 3 and the highest score is 15. Thus, when examining the level ranges obtained by dividing the difference between the lowest possible score and the highest score into three, it was found that they showed a moderate level of acceptance tolerance in the subscales of "Acceptance of Diverse Religions/Ethnicities", "Acceptance of Diverse Appearances" and "Acceptance of Diverse Ideas/Values".

Results regarding the difference of the social media generations' acceptance levels of diversity

In order to determine whether social media generations' level of acceptance of diversity differs or not, the scores obtained from the ADS and sub-scales were analyzed by one-way analysis of variance and are given in Table 3. According to this, Generation Z showed the lowest tolerance in terms of accepting diverse religions/ethnicities. In other words, the level of acceptance of diverse religions/ethnicities of Generation Z is significantly lower than other generations ($p < 0.00$). When we examine the dimension of acceptance of diverse appearances, the generation with the highest acceptance level was Y, and the acceptance level of the Baby Boomer Generation and Generation Z was found to be significantly lower than Generation Y ($p < 0.00$). There is no significant difference between generations in the dimension of accepting diverse ideas/values.

Table 3. The Difference of Generations' Acceptance Levels of Diversity

Sub-scale/Scale	Generations	n	$\underline{X}$	sd	F	p	Difference
Acceptance of Diverse Religions/Ethnicities	Baby Boomer	30	12,13	3,07	35,21	,00	Z< B. B. Z< X Z< Y
	X	34	13,26	1,91			
	Y	183	12,98	2,25			
	Z	269	10,42	3,16			
	Total	516	11,62	3,06			
Acceptance of Diverse Appearances	Baby Boomer	30	10,40	3,76	17,53	,00	B. B.<Y Z<Y
	X	34	11,29	3,17			
	Y	183	12,43	2,78			
	Z	269	10,27	3,31			
	Total	516	11,11	3,30			
Acceptance of Diverse Ideas/Values	Baby Boomer	30	10,03	2,04	1,07	,35	-
	X	34	9,94	1,93			
	Y	183	10,08	2,11			
	Z	269	9,69	2,48			
	Total	516	9,87	2,30			
ADS	Baby Boomer	30	32,56	5,87	29,64	,00	B. B.<Y Z<X Z<Y
	X	34	34,50	5,04			
	Y	183	35,50	5,65			
	Z	269	30,40	5,92			
	Total	516	32,61	6,23			

In the total of the scale, the Generation Z's acceptance level of the diversity was found to be significantly lower in comparison to Generations X and Y ($p < 0.00$). When the average scores obtained from the ADS are examined, the lowest score for all generations belongs to Z. On the other hand, a significant difference was found between the Baby Boomer generation and the Generation Y, where the Generation Y's acceptance level of diversity was found to be high.

Results regarding the difference of the social media generations' acceptance levels of diversity based on gender

In order to determine the difference of the social media generations' acceptance levels of diversity based on gender, the scores obtained from the ADS and subscales were analyzed with the independent group t-test and the obtained data are given in Table 4. To this, significant differences were found in the subscales and the total of the scale where women's acceptance levels of the diversity were higher than those of men. Accordingly, women have higher levels of acceptance of diverse religions/ethnicities, diverse appearances and diverse ideas/values than men.

Table 4. The Difference of Acceptance Levels of Diversity Based on Gender

Sub-scale/Scale	Gender	n	$\underline{X}$	sd	df	t	p
Acceptance of Diverse Religions/Ethnicities	Female	294	12,14	2,85	514	4,562	,000
	Male	222	10,92	3,19			
Acceptance of Diverse Appearances	Female	294	11,65	3,02	514	4,328	,000
	Male	222	10,40	3,53			
Acceptance of Diverse Ideas/Values	Female	294	10,32	3,07	514	3,502	,001
	Male	222	9,37	3,06			
ADS	Female	294	34,13	6,90	514	5,324	,000
	Male	222	30,70	7,65			

In the detailed examinations carried out in terms of generations, variations are spotted in the Generation Y and Z (Table 5). Accordingly, women's acceptance levels of diversity were found to be higher than men in the Y and Z generations. However, in Generation Z, there was no gender difference in the acceptance of diverse appearances.

Table 5. The Difference of Generations' Acceptance Levels of Diversity Based on Gender

Generation	Sub-scale/Scale	Gender	n	$\underline{X}$	sd	df	t	p
Y	Acceptance of Diverse Religions/Ethnicities	Female	111	13,43	1,92	181	3,396	,001
		Male	72	12,30	2,55			
	Acceptance of Diverse Appearances	Female	111	12,82	2,52	181	2,393	,018
		Male	72	11,83	3,06			
	Acceptance of Diverse Ideas/Values	Female	111	10,57	1,74	181	4,090	,000
		Male	72	9,31	2,41			
	ADS	Female	111	36,83	4,74	181	4,120	,000
		Male	72	33,45	6,32			
Z	Acceptance of Diverse Religions/Ethnicities	Female	154	11,06	3,09	267	3,927	,000
		Male	115	9,57	3,05			
	Acceptance of Diverse Appearances	Female	154	10,95	3,14	267	3,971	,000
		Male	115	9,37	3,34			
	Acceptance of Diverse Ideas/Values	Female	154	9,75	2,38	267	,465	-
		Male	115	9,61	2,61			
	ADS	Female	154	31,77	5,46	267	4,559	,000
		Male	115	28,56	6,04			

Results regarding the difference of the social media generations' acceptance levels of diversity based on daily social media usage

In order to determine the difference of the social media generations' acceptance levels of diversity according to daily social media usage, one-way analysis of variance, LSD test, Acceptance of Diversity Scale, and the scores obtained from the sub-scales were used to analyze the differences and the data obtained are presented in Table 6.

Table 6. The Difference of Acceptance Levels of Diversity Based on Daily Usage of Social Media

Sub-scale/Scale	Generations	n	$\underline{X}$	sd	F	p	Difference
Acceptance of Diverse Religions/Ethnicities	Less than 1 hour	137	11,04	3,01	2,461	,062	-
	1-3 hours	232	11,86	2,91			
	4-6 hours	85	11,91	3,35			
	More than 7 hours	24	11,45	2,90			
	Total	478	11,61	3,04			
	Less than 1 hour	137	10,81	3,27	3,035	,029	Less 1 h. < 4-6 h.

Acceptance of Diverse Appearances	1-3 hours	232	11,09	3,35			1-3 h. < 4-6 h. 7 h. more < 4-6 h.
	4-6 hours	85	11,91	3,02			
	More than 7 hours	24	10,00	3,21			
	Total	478	11,10	3,29			
Acceptance of Diverse Ideas/Values	Less than 1 hour	137	9,57	3,17	1,209	,306	-
	1-3 hours	232	10,16	3,05			
	4-6 hours	85	9,97	3,20			
	More than 7 hours	24	9,50	2,71			
	Total	478	9,93	3,10			
ADS	Less than 1 hour	137	31,43	6,91	2,736	,043	Less 1 h. < 1-3 sa. Less 1 h. < 4-6 sa.
	1-3 hours	232	33,13	7,51			
	4-6 hours	85	33,81	7,76			
	More than 7 hours	24	30,95	6,18			
	Total	478	32,65	7,37			

To this, a significant difference was found in the acceptance of diverse appearances. As the duration of daily usage of social media is increased, the tolerance of diverse appearances has also increased. It has been determined that the use of social media for 4 hours or more per day leads to differentiation. Accordingly, it has been found that those who use social media for 4 hours or more a day have higher levels of acceptance of diverse appearance than those who use it less. When the total ADS was examined, it was found that generations with less than 1 hour of social media usage had lower acceptance levels of diversities.

Results regarding the difference of the social media generations' acceptance levels of diversity based on social media usage time

In order to determine the difference of the social media generations' acceptance levels of diversity according to social media usage time, one-way analysis of variance and LSD test were conducted and the obtained results are used to analyze the differences which are presented in Table 7.

Table 7. The Difference of Acceptance Levels of Diversity Based on Social Media Usage Time

Sub-scale/Scale	**Generations**	**n**	$\underline{X}$	**sd**	**F**	**p**	**Difference**
Acceptance of Diverse Religions/Ethnicities	Less than a year	40	10,42	3,17	10,826	,000	Less 1 y. < 7-9 y. Less 1 y. < 10 y. more 1-3 y. < 7-9 y. 1-3 y. < 10 y. more 4-6 y. < 7-9 y. 4-6 y. < 10 y. more 7-9 y. < 10 y. more
	1-3 years	124	11,14	3,06			
	4-6 years	146	10,99	3,19			
	7-9 years	103	12,37	2,87			
	More than 10 years	100	12,93	2,25			
	Total	513	11,64	3,04			
Acceptance of Diverse Appearances	Less than a year	40	10,20	3,49	4,243	,002	Less 1 y. < 7-9 y. Less 1 y. < 10 y. more 1-3 y. < 7-9 y. 1-3 y. < 10 y. more 4-6 y. < 7-9 y. 4-6 y. < 10 y. more
	1-3 years	124	10,72	2,95			
	4-6 years	146	10,77	3,61			
	7-9 years	103	11,78	3,35			
	More than 10 years	100	11,92	2,83			
	Total	513	11,14	3,29			
Acceptance of Diverse Ideas/Values	Less than a year	40	9,40	3,23	4,677	,001	Less 1 y. < 7-9 y. 1-3 y. < 7-9 y. 1-3 y. < 10 y. more 4-6 y. < 7-9 y. 4-6 y. < 10 y. more
	1-3 years	124	9,31	3,15			
	4-6 years	146	9,63	2,97			
	7-9 years	103	10,80	2,97			
	More than 10 years	100	10,43	3,08			
	Total	513	9,92	3,10			
ADS	Less than a year	40	30,02	7,21	9,849	,000	Less 1 y. < 7-9 y. Less 1 y. < 10 y. more 1-3 y. < 7-9 y. 1-3 y. < 10 y. more 4-6 y. < 7-9 y. 4-6 y. < 10 y. more
	1-3 years	124	31,18	6,62			
	4-6 years	146	31,39	7,65			
	7-9 years	103	34,97	7,45			
	More than 10 years	100	35,28	6,65			
	Total	513	32,71	7,39			

It appears that there are significant differences in the subscales and the total of the scale. For example, those who have been using social media for a long time showed higher levels of acceptance of diversity.
It can also be said that as the time of social media use increases, the acceptance of diverse religions/ethnicities, acceptance of diverse appearances, and acceptance of diverse ideas/values increases in line with the obtained scores.

DISCUSSION AND CONCLUSION

In the study, which examined the social media generations' levels of acceptance of diversity, some results were obtained in line with the data obtained by applying the Acceptance of Differences Scale (ADS), which includes the dimensions of "Acceptance of Diverse Religions/Ethnicities", "Acceptance of Diverse Appearances" and "Acceptance of Diverse Ideas/Values". The differences between the Baby Boomer, X, Y, and Z generations, which consist of 516 social media users, were found to be moderate. This result obtained from the total ADS was also reflected in the subscales and it was revealed that the generations generally accepted the diversities in all dimensions at a moderate level. In other words, they showed tolerance.

Intergenerational comparisons showed that Generation Z has the lowest tolerance in terms of accepting diverse religions/ethnicities. As a result of this low tolerance by significantly differentiating from all generations when compared to other generations, it was revealed by questioning whether or not agreeing with these statements: "I have friends with different religious beliefs", "I can participate in the same working group with people of different religious beliefs", "I would establish friendships with people from different ethnic groups".

In the examinations made in the dimension of "acceptance of diverse appearances", the generation with the highest acceptance level was Y, and the acceptance level of Baby Boomer and Generation Z was found to be significantly lower than Y. This subscale included items such as: "I would consider someone who wears jewelry (piercing) on their nose, eyebrow or tongue as culturally lost.", "I would feel sorry for someone who has piercings on various parts of their body." and "If I am an employer, I wouldn't prefer someone with tattoos all over their body". Moreover, it has been revealed that Generation Y has a high tolerance to diversity and accepts such situations more than other generations.

When examining generation studies in the literature, it is seen that the Generation Y is the generation in which the differences are felt most clearly (Ekşili and Antalyalı, 2017; Kelgökmen İlic and Yalçın, 2017; Tutgun-Ünal, 2013). When the characteristics of the Generation Y are examined, it is stated that their self-esteem is high and they tend to form unity by nurturing a sense of belonging to people from different segments, views or opinions. Further, if the Generation Y gets support from their families, they show more self-defensive behaviors and their self-confidence increases. In this direction, as a result of the research, the fact that Ys accept people with diverse appearance (wearing jewelry, tattooing, etc.) at a high level has confirmed the studies in the literature.

On the other hand, it can be said that the low tolerance seen in Generation Z is added to the literature as a new result. While it is predicted that the younger generations, especially the Generation Z, who have been familiar with social media from an early age, will differentiate from traditional values by providing more interaction with the modern world, it may be due to the protective attitude of families towards their children from a young age since they have a close attitude to traditional values since it is known that social events affect the value transfer of generations. In this context, after the social events that took place in the world in a certain period when Generation Y had an active role, it can be thought that there may be sensitivity in social structures and this situation can be reflected by families on children.

In the study where investigations were made in the total of the ADS, Generation Z's level of acceptance of diversity was found to be lower than X and Y generations who are older than Generation Z, which was born in 2000 and after. It is noteworthy that the Zs did not differ from the Baby Boomer Generation born between 1946-1964. It can be said that the protective attitude developed after the aforementioned social events formed the ground for the growth of a Generation Z close to the traditional generation.

However, considering that Generation Z is predominantly composed of middle and high school students in the study, it can be said that the situation may change in the following years, students may go to university in different provinces, get married, establish roommates, use of technology may differ, and their values and behaviors may change with environmental factors. Thus, they should be followed. On the other hand, it has been revealed that Y's level of acceptance of the diversity, which is called the generation where the differences are felt most clearly, is higher than other generations in line with the score they received from the scale. This situation can be met as a natural result when considered in line with the generation researches in the literature.

In comparisons made according to gender, women's acceptance levels of diversity were found to be higher than men in Y and Z generations. It has been observed that this differentiation seen in younger generations is not reflected in older generations. Many studies on whether social media use differentiates according to gender are included in the literature and are discussed (Balcı and Gölcü, 2013; Çam and İşbulan, 2012; Özdemir, 2017; Tutgun-Ünal, 2015; Tutgun-Ünal, 2019). Different results are mentioned especially in digital addiction researches such as internet addiction, mobile phone addiction, and social media addiction. In a study on social media addiction, it was found that women depend more on social media for emotional support than men. In the same research, it is stated that men are negatively affected by social media and they have conflicts with people around them because of their use of social media (Tutgun-Ünal, 2015). On the other hand, when other studies are examined, it was emphasized that there is no gender difference in terms of social media addiction and daily social media use in a study conducted with Y generation university students (Tutgun-Ünal, 2019).

In the examinations made according to the daily social media usage time, it was revealed that the differences in social media use for 4 hours or more per day affect the level of acceptance of appearances. Accordingly, those who use social media for 4 hours or more a day have a high tolerance of acceptance towards people who wear piercings and tattoos on various parts of their body. When all dimensions were evaluated together in the total scale, it was concluded that the social media generations' acceptance levels of diversities for 1 hour a day were found to be low. It is stated in researches that 4 hours of internet use per day is significant in detecting internet addiction along with other determinants. (Goldberg, 1996; Young, 1996a,b, 2009). In this respect, it can be said that generations who spend 4 hours or more a day at social media have a risk in terms of negativities that may arise from overuse. On the other hand, it is natural for those who use social media for 4 hours or more to be more exposed to the differences in the wide communication network provided on a global scale compared to those who use it for less time and therefore normalize these differences in their lives.

In the study questioning how long generations have been using social media, the acceptance level of diversity among the generations who have used social media for a longer time is found to be higher. In line with the total scores of ADS, it was concluded that as the time of social media use increases, the acceptance of diverse religions/ethnicities, acceptance of diverse appearances and acceptance of diverse ideas/values increase. In this context, it can be said that people who make social media a part of their lives exhibit a more transitive structure in the formation of values and behaviors by establishing a bridge between the online world and the real world.

As a result of the research, it is confirmed once again that developments in the technological, economic, political, and social fields can cause changes in the cultural structures of societies. Accordingly, generations born in different time periods may show different characteristics. Thus, it has been concluded that there is a need for multidimensional analysis of generational studies considering the effects of social media networks that mediate global communication on values and behaviors.

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Annex-1. Acceptance of Diversity Scale (ADS)

Item No.	Items	NEVEr	Rarely	Sometimes	Often	Always
1	It bothers me to have friends of different religious beliefs.					
2	I can participate in the same working group with people of different religious beliefs.					
3	I do not make friends with people from different ethnic groups.					
4	I would consider someone who wears jewelry (piercing) on their nose, eyebrow or tongue as culturally lost.					
5	I would feel sorry for someone who has piercings on various parts of their body.					
6	If I am an employer, I wouldn't prefer someone with tattoos all over their body.					
7	I would disconnect from those who have contrary views on social media.					
8	I would not like to see people with outlier preferences in my family circle.					
9	It bothers me to befriend someone who has a contrary lifestyle.					

TPACK for meaningful learning survey: "paths" for professional development of biology teachers in Brazil

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ABSTRACT
In the last decade different instruments were developed to empirically test the TPACK theoretical framework. The TPACK for Meaningful Learning survey was the first survey to obtain statistical validation for all seven predicted constructs. In the present work we used a version of the TPACK for Meaningful Learning survey adapted and validated in the Portuguese language to investigate the TPACK perceptions of Brazilian biology teachers, their interrelationships and relations with demographic variables. Results indicate a strong positive correlation between the constructs that hold the technology component. Path analysis corroborated the hypothesis that TK influences TPK and TCK, and that these two constructs directly influence TPACK. Evidence showed that the variables "age" and "years of service" influence teachers' perceptions, especially the constructs that hold the technology component. Results obtained in the present study are discussed considering the empirical results obtained in other countries using the TPACK for Meaningful Learning survey. Taken together, our research findings contribute to foster professional development strategies for teachers that aim at the integration of technologies in teaching.
Keywords: in-service biology teachers, professional development, country-specific developments, technological pedagogical content knowledge

1. Introduction and literature review
1.1. TPACK theoretical framework
Teaching is characterized by a great diversity of situations faced by teachers, including the interconnections between theory and practice, requiring interweaving of different types of knowledge applicable in different situations. Based on this proposition, Lee Shulman (1986, 1987) argued that content and pedagogy were combined in the minds of experienced teachers, to the point of generating a kind of knowledge distinct from the knowledge of a pedagogue and that of an expert in a given area of knowledge. This specific knowledge, the Pedagogical Content Knowledge, reflects how solutions for learning issues can be presented, adapted, and organized for instruction as specific topics (Shulman, 1986, 1987).

According to Shulman's (1986, 1987) views, specific teaching topics could be represented using different approaches, as demonstrations, analogies, examples, explanations what will turn the contents more comprehensive. Mishra and Koehler (2006) argued that technologies will play essential function in each of these aspects. In such, technologies may assist teachers by making contents more accessible to students by providing a range of representation and demonstration possibilities (Mishra & Koehler, 2006). These authors proposed the theoretical framework Technological Pedagogical Content Knowledge (TPACK), which theoretically predicts the interrelationship not only of pedagogical knowledge with content, but also of these two with technological knowledge. This theoretical formulation enabled to predict the existence of seven different constructs. Box 1 presents conceptual definitions based on Chai, Koh and Tsai (2011), Koh, Chai and Tsai (2013) and Mishra and Koehler (2006), as well as examples for each of the seven constructs foreseen in the TPACK theoretical framework.

The addition of technological knowledge (TK) to the pedagogical content knowledge (PCK) provided a new approach to address integration of technology in teaching. Since then, means to assess teachers' TPACK perceptions have been sought and proposed. Many writers are especially concerned with the processes by which technology would integrate with content and pedagogy (Chai, Koh, & Tsai, 2013, Graham, 2011, Herring, Koehler, & Mishra, 2016, Niess, 2011, Voogt, Fisser, Roblin, Tondeur, & van Braak, 2013, Wu, 2013, Willermark, 2017), as well its relationship with age and field experiences affects the technology integration of preservice and in-service teachers, in special their beliefs and intentions (Cheng & Xie, 2018; Nelson & Hawk, 2020).

The TPACK theoretical framework is important for the area of research on teacher´s education aiming at allowing the integration of technologies into their pedagogical practices (Herring et al, 2016, Graham, 2011, Wu, 2013). Researchers worldwide studied how teachers perceive their knowledge on integrating technology into teaching using different methods. TPACK measurements can happen in many formats. It can be done by interviews, artifact or field observations, surveys, and performance-evaluation instruments or open-ended questionnaires (Koehler et al., 2012). (Koehler, Shin, & Mishra, 2012; Voogt et al, 2013). Willermark (2017) in systematic literature review about application of how measure TPACK framework, showed that there is many approaches and instruments to evaluate teacher TPACK knowledge, however the most common was using self-report. However, Akyuz (2018) compared TPACK performance-assessment vs. self-assessment of pre-service Math teachers and found to yield similar results except for pedagogy constructs.

Table 1. Definitions and examples for TPACK constructs

Constructs	Definition*	Example **
Content Knowledge (CK)	Knowledge about content.	Knowledge about Biology.
Pedagogical Knowledge (PK)	Knowledge about teaching methods.	Knowledge of how to use problem-based learning.
Pedagogical Content Knowledge (PCK)	Knowledge about the adoption of pedagogical strategies to make contents more understandable for students.	Knowledge on how to conduct practical classes to teach biological concepts.
Technological Knowledge (TK)	Knowledge on technological tools.	Knowledge on how to use Web 2.0 tools (example Wiki, Blogs, Facebook).
Technological Pedagogical Knowledge (TCK)	Knowledge of how to use technology to represent contents in different ways.	Knowledge on how to use animations to present the processes of embryonic development.
Technological Content Knowledge (TPK)	Knowledge on using technology to implement different teaching methods.	Knowledge on using Wiki as a communication tool to increase collaborative learning.
Technological Pedagogical Content Knowledge (TPACK)	Knowledge on using technology to implement teaching methods of different types of content.	Knowledge on using Wiki as a communication tool to increase collaborative learning in biological concepts

* Based in Chai, Koh and Tsai (2011), Koh, Chai and Tsai (2013) and Mishra e Koehler (2006).
** Examples adapted to biological knowledge.

1.2. TPACK for meaningful learning surveys

Several instruments aimed at testing empirically the seven constructs predicted by Mishra and Koehler (2006) in the TPACK theoretical framework were developed (Chai, Koh & Tsai, 2016; Willermark, 2017). From a systematic review of the literature, Voogt et al (2013) found 11 studies related to the measuring of TPACK teachers´ constructs using surveys. Eight out of eleven studies used statistical tests to evaluate the psychometric properties of the developed surveys. Among these studies, the work of Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009); Chai, Koh, & Tsai (2010); Koh, Chai, & Tsai (2010); Chai, Koh, & Tsai (2011) are highlighted as a sequence of attempts to validate instruments composed of similar sets of items.

The study by Chai et al (2011) was the first to obtain statistical validation for the seven constructs using the TPACK for Meaningful Learning survey (TPACK-SML). The TPACK-SML was responded by three hundred and thirty-six Singaporean preschool teachers from a 3month course about integration of ICT for teaching and learning. Another use of this survey was carried out with 455 practicing teachers in Singapore (Koh et al., 2013).

These participants were recruited from a professional ICT development program promoted by an Research Project. Once again, the TPACK-SML obtained statistical validation for the seven constructs, demonstrating its validity and reliability (Koh et al., 2013). In 2013, one more slightly modified version of TPACK-SML was answered by 366 Taiwanese teachers (Liang, Chai, Koh, Yang, & Tsai, 2013). Although items related to Content Knowledge were not changed, new items were added to the other constructs. In addition, adaptations were made to direct the focus of the TK construct to Web-based technologies (Liang et al., 2013). The factorial analysis resulted in the validation of only six constructs, since the pre-determined items for TPK and TCK were grouped into a new factor called TPTCK (Liang et al., 2013).

In other new use of TPACK-SML with teachers from Singapore, Koh and Chai (2014) investigated TPACK perceptions of teachers before and after participating in a course focused on the elaboration of lesson plans using Information and Communication Technologies (ICT). This version of TPACK-SML presented statistical validation for the seven constructs predicted in the TPACK theoretical framework, demonstrating its validity and reliability (Koh & Chai, 2014). More recently, Liu, Zhang and Wang (2015) obtained responses from 2728 Chinese teachers for a modified version of the TPACK-SML. The authors retained the essence of the original items used by Koh and Chai (2014). Additional adaptations were made to direct the focus of items to multimedia technologies. However, this survey obtained statistical validation for only five constructs to know: CK, PK, TK, PCK and a combined factor, called TPK-TCK-TPACK (Liu et al., 2015).

1.3. The Brazilian TPACK for meaningful learning survey

Systematic study reviews of TPACK theoretical framework published in English language did not recover studies related to the Brazilian context (Chai et al., 2013, Koehler et al., 2012, Voogt et al., 2013). Recently, systematic reviews carried out with studies in Portuguese language indicated that the scientific production in Portuguese-speaking countries is at early stage. In these studies, reports mainly point out TPACK as an important theoretical framework, although no study attempted to measure different type of teachers' knowledge on integration of technology in teaching (Rolando, Luz & Salvador, 2015; Nogueira, Pessoa & Gallego, 2015). According to these authors, no records of studies on the validation of surveys on teachers' perceptions about TPACK constructs in Portuguese-speaking countries were reported.

In order to fill this gap, the TPACK-SML version validated by Koh et al (2013) was submitted to the process of cross-cultural adaptation (Beaton, Bombardier, Guillemin & Ferraz, 2000), generating a Brazilian version of the TPACK-SML in Portuguese language (Rolando et al., 2018). This version obtained statistical validation through factorial analysis for the seven TPACK constructs.

2. Research questions

The present study aims to measure TPACK perceptions of Brazilian biology teachers, their interrelationships and relations with demographic variables, as well as to discuss them in a way that indicate possibilities of action in teachers` professional development programs. Therefore, we organized our results section into two subsections, each one related to a specific research question:

- What TPACK constructs should be emphasized in future professional development programs for teachers so that they enhance their ability to integrate technologies in teaching of biology?

- Do the variables “age” and “years of service” influence the confidence of biology teachers in relation to the seven constructs of the TPACK theoretical framework?

3. Methodology

3.1. Participants and context of the study

A total of 440 biology teachers from the public education network of the State of Rio de Janeiro, Brazil, participated in this study. Participating teachers attended the Teacher Education Program (TEP), offered by the State Department of Education of Rio de Janeiro in partnership with the Foundation Center of Science and Higher Distance Education of the State of Rio de Janeiro (https://www.cecierj.edu.br/). Teachers were of around 40.08 years old (Desvp = 9.40); 12.63 years of service (Desvp = 8.45) and 72.5% of participants were women.

The TEP was structured as a course offered remotely by means of a virtual learning environment (VLE) built on the Moodle educational platform (Modular Object-Oriented Dynamic Learning Environment). The distribution of didactic material, the online activities, as well as the interaction between the course participants and tutors responsible for conducting them took place in the VLE. The course was structured in three stages: (i) planning, (ii) implementation, and (iii) evaluation. In the planning stage, a broad set of materials was made available to the course participants; lesson plans, learning objects, texts in PDF for printing, images, videos and animations

directed to the teaching of major subjects of Biology (example, Energy sources, Diversity of living beings, Ecosystems, Biotechnology, among others). After exploring the didactic material, participants elaborated a lesson plan to guide their teaching in the classroom during the implementation phase. Both in the planning and implementation stages, course participants took part in a thematic forum for online discussion with their peers and tutors. In the evaluation stage, course participants rewrote the lesson plan based on the feedback obtained in the implementation stage.

Teachers were invited to participate in the present study through an official communication of the general coordination of the TEP via e-mail. This message presented the subject of the survey to those enrolled in the TEP, indicated the electronic address of the survey to be answered and made informed consent forms available.

3.2. Instrument of data collection

The instrument used to collect the data analyzed in this study was the Brazilian version of TPACK-SML (Rolando et al., 2018). This survey covers 29 items measured at a 7-point Likert-type scale rated as (1) strongly disagree, (2) disagree, (3) slightly disagree, (4) neither agree nor disagree, (5) slightly agree, (6) agree, and (7) strongly agree.

According to Chai et al (2016) the TPACK for Meaningful Learning was progressively formulated and revised towards meaningful learning with an ICT framework (Howland, Jonassen, & Marra, 2012). The term "Meaningful Learning" used in the formulation of items related to pedagogical knowledge refers to the five dimensions of meaningful learning (active, cooperative, constructive, intentional and authentic) (Howland et al, 2012).

The Brazilian version of TPACK-SML uses the term Biology to refer to the CK construct since it was used exclusively with teachers of this subject. This approach allowed a more in-depth discussion on teacher training related to the integration of technology in biology teaching. Appendix 1 contains the Brazilian version of TPACK-SML and the mean scores for each of the seven constructs and the 29 items. The reliability of the survey was high, with overall Cronbach alpha of 0,923. Reliability of the seven TPACK constructs was also established as each presented high Cronbach alphas as: CK (α= 0,846), PK (α= 0,854), TK (α= 0,851), PCK (α= 0,853), TPK (α= 0,878), TCK (α= 0,752), TPACK (α= 0,759) (Rolando et al., 2018). All coefficients exceeded recommended minimum value of $\alpha = 0.70$ (Hair, Anderson, Tathan, Black, 2010; Nunnally, 1967). The confirmatory factorial analysis showed satisfactory model fit in relation to the studied sample ($\chi^2 = 906{,}126$, $\chi^2/df = 2{,}545$, $p < 0.001$, TLI = 0.909, CFI = 0.920, RMSEA = 0.059). Factors loaded according to the pre-defined structure for all seven TPACK constructs with loadings larger than 0.50 (Rolando et al., 2018).

3.3. Data analysis

To proceed with the structural equation modeling, more specifically to the confirmatory factor analysis followed by the path diagram structural equation model, the maximum likelihood method was used. To perform path analysis, the AMOS v.22 software was used. In this analysis the following statistical criteria were used: Chi-square (χ^2), Root Mean Square Error of Approximation (RMSEA), Chi-square normalized (χ^2/df), Tucker-Lewis index (TLI) and Comparative fit index (CFI). The path analysis has been used by many authors to verify association within TPACK constructs, and between the constructs and other aspects and variables of preservice and in-service teachers (Cheng & Xie, 2018; Taimalu & Luik, 2019; Nelson & Hawk, 2020).

Analysis of correlations between the TPACK constructs and those using the demographic variables “age” and “years of service” was performed using the Pearson correlation. To perform correlation tests, the GraphPad Prism v.5 software was used. Statistical analyzes are based on the precepts of Fraenkel and Wallen (2008), according to correlation coefficients (r) values between 0.41 and 0.60, large enough for practical and theoretical use. According to these authors, values of r between 0.61 and 0.80 are considered especially important in the research context.

4. Results

4.1. What TPACK constructs should be emphasized in future professional development programs for teachers so that they enhance their ability to integrate technologies in teaching of biology?

Based on the theoretical assumptions of Shulman (1986, 1987) and Mishra and Koehler (2006) concerning the interrelationship between different types of knowledge (CK, PK, TK), and also the emergence of different intermediary knowledge (PCK, TCK, TPK) and the TPACK as integrated knowledge, we tested the hypothetical model (Figure 1), aiming at identifying possible influence relations amongst the seven predicted constructs:

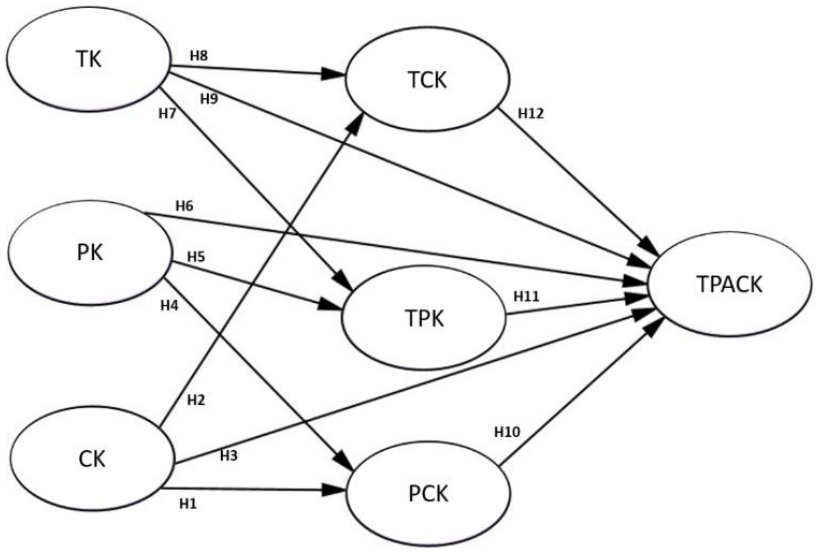

Figure 1. The hypothesized path model

The feasibility of testing this model by the analysis of correlations amongst the seven constructs was verified. Positive correlations with significance level of $p < .01$ among all the TPACK constructs were obtained (Table 1). Together, these results indicate that these relationships can be analyzed using the path diagram structural equation model.

Table 1. Inter-correlations among constructs

	CK	**PK**	**PCK**	**TK**	**TPK**	**TCK**	**TPACK**
CK	1						
PK	.350**	1					
PCK	.393**	.341**	1				
TK	.349**	.304**	.214**	1			
TPK	.274**	.520**	.194**	.622**	1		
TCK	.261**	.358**	.208**	.628**	.628**	1	
TPACK	.349**	.492**	.248**	.580**	.668**	.650**	1

** Correlation is significant at the .01 level.

To test the hypothetical model proposed in Figure 1, a path model with structural equation modeling was used (Figure 2). Confirmatory factor analysis showed satisfactory Goodness-of-Fit Measures indexes in relation to the studied sample ($\chi^2 = 968.805$, $\chi^2/df = 2.676$, $p < 0.0001$, TLI = 0.901, CFI = 0.912, RMSEA = 0.062).

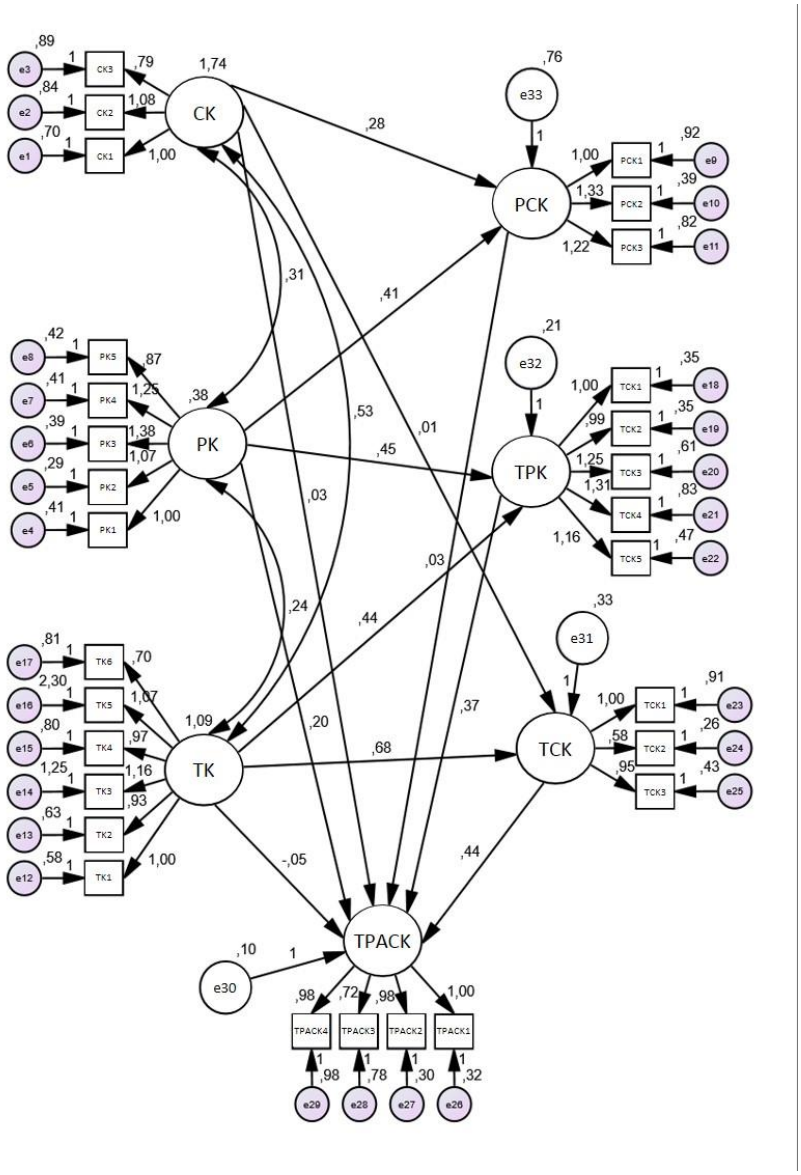

Figure 2. Path diagram structural equation model

The hypotheses H1, H4, H5, H6, H7, H8, H11 and H12 were corroborated (Table 2). In summary, these results indicate:

(i) The CK influences only the PCK (H1). On the other hand, the PCK does not influence the TPACK (H10). This result shows that the CK does not influence directly on the constructs that hold the "Technology" component.

(ii) The PK influences the PCK and the TPK (H4 and H5), as well as the TPACK (H6). This result indicates that the PK influences directly the constructs that hold the Technology component.

(iii) The TK influences the TPK and the TCK (H7 and H8), but not directly the TPACK (H9). This result show that the TK might influence the TPK and the TCK constructs, and that these two, in turn, influence directly the TPACK (H11 and H12).

Table 2. TPACK structural equation model path coefficients

Hypothesis		Path		Path coefficient	Standard error	Critical ratio	P
H1	CK	--->	PCK	.275	.045	6.179	***
H2	CK	--->	TCK	.007	.034	0.219	.827
H3	CK	--->	TPACK	.029	.026	1.125	.261
H4	PK	--->	PCK	.414	.093	4.478	***
H5	PK	--->	TPK	.449	.059	7.640	***
H6	PK	--->	TPACK	.196	.061	3.206	.001
H7	TK	--->	TPK	.438	.037	11.774	***
H8	TK	--->	TCK	.685	.059	11.607	***
H9	TK	--->	TPACK	-.045	.066	-0.689	.491
H10	PCK	--->	TPACK	.026	.031	0.853	.394
H11	TPK	--->	TPACK	.369	.069	5.388	***
H12	TCK	--->	TPACK	.441	.068	6.524	***

***p< .0001

4.2. Do the variables "age" and "years of service" influence the confidence of biology teachers in relation to the seven constructs of the TPACK theoretical framework?

Hypotheses:

H1. The younger the teacher, the greater the confidence in his / hers TK, TPK, TCK and TPACK.

H2. The longer the years of service, the greater the teacher's confidence in relation to his / hers PK and PCK.

Regarding the use of technology, hypothesis H1 stems from the idea that young teachers would be the so-called digital natives, due to early exposure to the technology and the internet. Older teachers, however, could be considered digital immigrants, as they find themselves in the midst of changing of customs and habits (Prensky, 2001; Székely & Nagy, 2011). In this perspective, older teachers would have greater difficulty adapting to the use of new tools and technological resources. On the other hand, H2 is justified since their longer experience in teaching brings greater confidence in relation to the constructs that hold the pedagogical component (Shulman, 1987).

Table 3 presents correlation results between variable "age" and each of the seven constructs. As stated in hypothesis H1, negative correlations between teacher's age and their confidence in relation to TK, TPK, TCK and TPACK were found. The small R^2 values obtained suggest evidence that the "age" variable influences teachers' confidence in relation to TK, TPK, TCK and TPACK, but it does not explain only by itself the observed covariations. On the other hand, no correlation was found between the teacher's "age" and the constructs that do not hold the technology component (Table 3).

Table 3. Correlations between variable "age" and constructs

Constructs	Pearson r	95% Confidence Interval	*p* (two-tailed)	R^2
CK	-.02237	-0.1156 to 0.07129	.6399	.0005002
PK	.07109	-0.02257 to 0.1635	.1366	.005053
PCK	-.03398	-0.1271 to 0.05972	.4772	.001154
TK	-.2835	-0.3673 to -0.1952	P<.0001	.08040
TPK	-.1578	-0.2476 to -0.06524	.0009	.02490
TCK	-.1955	-0.2838 to -0.1039	P<.0001	.03822

TPACK	-.1029	-0.1946 to -0.009515	.0309	.01059

Table 4 shows correlation results between the variable "years of service" and each of the seven constructs. A positive correlation was observed between "years of service" and the PK variable, indicating that as the teaching time increases, the pedagogical knowledge of the teacher also increases, partially corroborating the H2 hypothesis. No correlations were found between the variable "years of service" and the CK, PCK and TPACK (Table 4).

Table 4. Correlations between variable "years of service" and constructs

Constructs	Pearson r	95% Confidence Interval	*p* (two-tailed)	R^2
CK	-.02317	-0.1164 to 0.07049	.6280	.0005366
PK	.1316	0.03861 to 0.2224	.0057	.01733
PCK	.007696	-0.08587 to 0.1011	.8721	.00005923
TK	-.2183	-0.3056 to -0.1274	P<.0001	.04765
TPK	-.1248	-0.2158 to -0.03167	.0088	.01558
TCK	-.1163	-0.2076 to -0.02306	.0146	.01353
TPACK	-.05631	-0.1490 to 0.03739	.2385	.003171

There are negative correlations between the variable "years of service" and teacher confidence in relation to constructs TK, TPK, TCK (Table 5). These results indicate that the longer the "years of service", the lower is their confidence in the TK, TPK and TCK. However, R^2 values obtained are low, indicating that factors other than "years of service" influence the observed correlations. This finding may be related to the strong correlation found between the variables "age" and "years of service" ($p < .0001$; R squared 0.5628), reinforcing findings on the H1 hypothesis.

5. Discussion

Analysis of teachers' perceptions on different constructs foreseen in the TPACK theoretical framework is an important and growing trend in the last decade, especially the collection of data using surveys (Abbitt, 2011; Chai et al., 2013, Voogt et al., 2013, Willermark, 2017). Among several attempts of psychometric validation using statistical tests of validity and reliability, we highlight the results obtained with the TPACK-SML, validated in different countries; Singapura (Chai et al., 2011; Koh et al., 2013; Koh & Chai, 2014), Taiwan (Liang et al., 2013) and China (Liu et al., 2015), and more recently in Brazil (Rolando et al., 2018).

Results obtained in the present study confirm previous findings that all seven constructs are positively correlated with each other (Chai et al., 2011; Koh et al., 2013). Our results also indicate a strong positive correlation between the constructs that hold the technology component. These correlations were confirmed by the path analysis technique, which corroborated the hypotheses that TK influences the intermediary constructs TPK and TCK, and that these two constructs, in turn, directly influence the TPACK construct.

Koh et al (2013) obtained similar results with teachers in Singapore, especially on the implication from TPK and TCK on TPACK. Results showed that teachers make four direct paths to TPACK. There paths are TK, PK, TCK, and TPK. They also found that TK and PK to have some direct effects on TPACK. However, TCK and TPK showed larger path coefficients, showing that these have stronger direct effects on TPACK than TK and PK. In view of these findings, we can argue that TK does not seem to be as important as the intermediary constructs TPK and TCK when teacher´s confidence in relation to TPACK is considered. It is reasonable to assume that knowledge about technologies, such as the use of computers or social media, becomes an important factor of confidence so that the teacher perceives him/herself capable of integrating these same technologies into his/her teaching practice. For instance, by mastering these technologies, he/she becomes able to help students to use them in order to search more information autonomously (TPK2). Likewise, biology teachers are greatly confident about the TCK, especially about their ability to use technologies to research on biology and use multimedia resources as animations to convey some biological contents.

It was also observed that the PK influences the intermediary constructs PCK and TPK, as well as TPACK but in a low or moderate manner. These results, like those found by Koh et al (2013), indicate that teachers were more confident about general pedagogical knowledge related to pedagogical processes and methods than to teaching

processes closely related to the content itself (PCK). The fact that the CK influences only the PCK, and that PCK, in turn, does not directly influence the TPACK, corroborates this interpretation.

In relation to our first research question, the above results suggest that professional development programs aiming to improve teachers´ TPACK should emphasize the TCK and TPK constructs as well as the interrelationship between them. Such programs could create opportunities for teachers to develop the ability to integrate their knowledge of TICs that present biological contents (examples; videos, animations and simulators) with TICs that enable the creation of processes based on active learning and teaching methodologies (examples; collaborative learning and problem-based learning). Technological resources, such as animations, have the potential to increase the visualization of processes and natural phenomena (Teixeira, Benchimol, Crepaldi & de Souza, 2012; Mayer, 2002), facilitating the understanding of contents considered difficult for students, as proposed by Mishra and Koehler (2006). On the other hand, TICs as virtual learning environments or social network softwares can be used by teachers to increase collaboration among students, while they are being guided to seek solutions to real problems related to contemporary issues involving biological knowledge.

The proposition to emphasize the TCK and TPK constructs is also valid when we consider the context faced by Brazilian teachers. Recent research reports that only 11% of Brazilian schools house science laboratories, making it difficult to teach biology through laboratory practices (QEdu Academia, 2014). However, 61% of these schools have access to the internet and 45% have computer labs (QEdu Academia, 2014). This infrastructure could be used to mitigate the lack of science laboratories, enabling teachers to make use of technological resources. This finding does not at all suggest that Science laboratories should or could be replaced by computer facilities but only that the latter could prove helpful when and while more effective solutions are unavailable.

Turning to the second research question, the hypothesis that a young teacher may be more confident about his TK than an older teacher is supported, at least in part, by the influence of the variable "age" on teacher´s confidence in relation to the constructs TK, TPK, TCK and TPACK. This hypothesis is also supported by the negative relation between years of service and confidence in the constructs that hold the Technology component.

Together, these data corroborate results found by Liang et al (2013) and Liu et al (2015). According to these two studies, more experienced teachers have less knowledge about ICTs and on how to teach using these technologies (Liang et al, 2013; Liu et al, 2015). Liu et al. (2015) found a negative relationship between the variable “years of service” and the confidence in their own technological knowledge. Teachers who had between 1 and 5 years of service presented scores significantly higher than those ranging from six to more than 20 years of service (Liu et al., 2015). On the other hand, teachers who had six or more years of service were more confident about PK than beginners (1 to 5 years of service) (Liu et al., 2015).

Nelson & Hawk (2020) using structural equation modeling to predicted beliefs and intentions changes, described that technology utility can predict intentions to use technology and Meaningful Learning strategies, which will foster technology integration among teachers. It shows the impact of field experiences on beliefs and intentions of preservice teachers, where they will see technology in classroom frequently and watch the skilled teachers using meaningful learning strategies in integrated mindset. Furthermore, Cheng & Xie (2018) for in-service teachers showed how value beliefs around technology integration are the most important aspects to produce TPACK integration. It means that in addition to knowledge, beliefs also impact the integration of technology. However, Taimalu & Luik (2019) in a path analysis of TPACK for in-service teachers showed that only technology knowledge and have direct influence on technology integration. The beliefs about technology value have indirectly influenced on technology integration. Moreover, pedagogical knowledge had a significant influence on technology integration. Scherer et al. (2018) using many structural equation modeling approaches discuss that the attitudes toward technology and TPACK self-beliefs were well associated. However, the attitudes and TPACK dimensions has differences.

In the present study we have also found evidence that the variables “age” and” year of service” influence teacher´s knowledge, especially on the constructs that include the technology component. This greater mastery of the constructs related to the technology knowledge by younger teachers is corroborated by two previous studies. According to Martins et al. (2015), 50% of pre-service Biology teachers made weekly use of Internet tools to study biology. In another study, Rolando, Salvador & Luz (2013) showed that only 26% of in-service Brazilian biology teachers used those tools to study whilst only 7% used them to teach. On the other hand, the present study show that more experienced teachers report greater confidence in the PK than more inexperienced teachers.

Although the correlations found have small explanatory value, it seems valid to take them into account when formulations of proposals are aimed at improving teachers' TPACK. It is reasonable to speculate that the

promotion of collaborating activities between teachers with more years of service with novice or even pre-service teachers could be a strategy to be adopted by teachers´ education programs, aiming at the sharing of technological knowledge and teaching experience.

7. Conclusions and implications

Statistical validation of the TPACK-SML obtained by Chai et al. (2011) opened perspectives for the accomplishment of several empirical studies aimed at assessing teachers' perceptions of the TPACK. This instrument has been adapted and used in different countries and more recently in Brazil. These studies focused mainly on validation results and/or the analysis of statistical interrelations between the constructs among themselves and with other socio-demographic variables.

Teachers analyzed in the present study were more confident about the knowledge that holds the technology component (TK, TCK, TPK and TPACK). Among them, the TCK stands out, indicating that the teachers can research with the use of technologies, as well as use multimedia resources and simulators to represent Biology contents. The relationships between the constructs that hold the technology component presented r values greater than between those that do not hold this component. The path analysis employed in this study indicated that TK influences TPK and TCK, which in turn directly influence the TPACK. Regarding the relationships between the seven constructs of the TPACK framework with the demographic variables as "age" and "years of service", there were indications that these variables could influence teachers' knowledge.

Based on the findings so far, it is possible to indicate that programs aimed at improving teachers' TPACK could include activities that stimulate the combination of the TCK and TPK that can be brought in when experienced and novice teachers collaborate.

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Appendix 1

Brazilian version of the TPACK for Meaningful Learning survey (Rolando et al., 2018) and average scores for each of the seven constructs as well as for the 29 items. This survey is based on TPACK-SML version validated by Koh et al (2013) submitted to the process of cross-cultural adaptation (Beaton, Bombardier, Guillemin & Ferraz, 2000), generating a Brazilian version of the TPACK-SML in Portuguese language.

Items	**Mean**	**SD**
Content Knowledge (CK)	**4,88**	**1,36**
CK1 – I have sufficient knowledge about Biology	5,14	1,56
CK2 – I can think about Biology like a expert	4,25	1,69
CK3 – I am able to develop deeper understanding about Biology	5,25	1,40
Pedagogical Knowledge (PK)	**5,63**	**0,74**
PK1 – I am able to stretch my students' thinking by creating challenging tasks for them	5,70	0,89
PK2 – I am able to guide my students to adopt appropriate learning strategies	5,68	0,85
PK3 – I am able to help my students to monitor their own learning	5,42	1,06
PK4 – I am able to help my students to reflect on their learning strategies	5,50	1,01
PK5 – I am able to guide my students to discuss effectively during group work	5,83	0,84
Pedagogical Content Knowledge (PCK)	**5,01**	**1,29**
PCK1 – Without using technology, I can address the common misconceptions my students have for Biology	5,19	1,40
PCK2 – Without using technology, I know how to select effective teaching approaches to guide student thinking and learning in Biology	5,00	1,48
PCK3 – Without using technology, I can help my students to understand Biology through various ways	4,84	1,53
Technological Knowledge (TK)	**5,18**	**1,10**
TK1 – I have the technical skills to use computers effectively	5,73	1,29
TK2 – I can learn technology easily	5,76	1,25
TK3 – I know how to solve my own technical problems when using technology	4,73	1,65
TK4 – I keep up with important new technologies	5,34	1,36
TK5 – I am able to create web pages	3,53	1,88

TK6 – I am able to use social media (e.g. Blog, Wiki, Facebook)	5,98	1,16
Technological Pedagogical Knowledge (TPK)	**5,53**	**0,94**
TPK1 – I am able to use technology to introduce my students to real world scenarios	5,82	0,97
TPK2 – I am able to facilitate my students to use technology to find more information on their own	5,81	0,97
TPK3 – I am able to facilitate my students to use technology to plan and monitor their own learning	5,27	1,24
TPK4 – I am able to facilitate my students to use technology to construct different forms of knowledge representation (text, graphic, table, image, video, comics, etc.)*	5,22	1,36
TPK5 – I am able to facilitate my students to collaborate with each other using technology	5,51	1,13
Technological Content Knowledge (TCK)	**5,82**	**0,88**
TCK1 – I can use the software that are created specifically for Biology (armazenadores de dados, Enciclopédia Multimídia Seres Vivos®, Corpo humano e sistemas P3D, entre outros)**	5,36	1,33
TCK2 – I know about the technologies that I have to use for the research about Biology	6,27	0,74
TCK3 – I can use appropriate technologies (e.g. multimedia resources, simulation) to represent the Biology	5,82	1,10
Technological Pedagogical Content Knowledge (TPACK)	**5,68**	**0,79**
TPACK1 – I can teach lessons that appropriately combine Biology, technologies and teaching approaches	5,75	0,94
TPACK2 – I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn	5,82	0,92
TPACK3 – I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom	5,87	1,04
TPACK4 – I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school	5,30	1,24

* Example of forms of knowledge representation
** Examples of softwares are presented in Portuguese language, as they are proper names.

Understanding the Effect of Culture on E-Book Popularity during COVID-19 Pandemic

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ABSTRACT
Coronavirus Pandemic has changed the way that people live, interact and communicate with others. Some modifications are transitory, while others seem to be permanent. Seeking for social and human development, many individuals find in educational courses a way to get a better quality of life. During the lockdown periods, reducing human contact, information technology plays an important role to enable the access of books by individuals. Cultural factors at a country level also can expand or decrease the interest in information technologies to access electronic books (e-books). Therefore, considering the lockdown limitations during the COVID-19 pandemic, this paper tests the effect of culture on e-book popularity among different countries. First, we observed a significant increase in the popularity of e-books during the lockdown period, which reinforces the potential that information technology has to generate different values for individuals and firms during lockdown restrictions. Large countries, and countries with better levels of information technology tend to search more for e-books during the lockdown. Moreover, masculinity and power distance are two dimensions of culture that seem to be related to the changes in the interest of e-books during pandemics. These results highlight new questions that can be explored in further research.
Keywords: E-Books; Cross-Country Analysis; Technology Adoption.

1. INTRODUCTION

COVID-19 represents a "global society shock", generating unprecedented impacts on the world, affecting capital supply, labor market, supply chain management, home life, peoples' health, among others (Coombs, 2020; Papadopoulos, Baltas & Balta, 2020; Venkatesh, 2020). It may represent a unique situation across generations (Venkatesh, 2020). Lockdowns over the world and temporarily closure of businesses have required many actions by governments and individuals (Papadopoulos, Baltas & Balta, 2020), and Information and Communication Technologies (ICTs) play a special role in this regard.

ICTs contribute to facilitate the life of people and firms. In normal conditions, individuals have the option to choose an appropriate moment to adopt and start using ICT resources. Many factors can affect the initial adoption and the use of information technology, and they include market pressure, competition, behavioral / individual characteristics, and technology itself (Albertin & Albertin, 2012). In a mandatory context (Venkatesh et al., 2003), ICTs adoption can be affected and modified, which is the case forced by lockdown restrictions to prevent Coronavirus contagion. Therefore, Coronavirus pandemic represents an external event in the market that exerts a pressure in the environment and also affects ICTs use/adoption. A strong movement to digitalization started together with the isolation measures.

COVID-19 has generated a decrease in social activities, to reduce human contact, and an increase in other activities, such as eating at home (Coombs, 2020; Papadopoulos, Baltas & Balta, 2020) and working at home (home office). To deal with COVID-19 restrictions, many small firms use digital technologies that have potential to help the process of value creation (Papadopoulos, Baltas & Balta, 2020). On one hand, the impacts of COVID-19 increased the interest in information technology resources. For example, video conference offers to individuals the opportunity to keep in contact during these times (Coombs, 2020). In this way, the COVID-19 pandemic affected the digital world, generating opportunities to expand technology-based solutions (Sein, 2020; He, Zhang,

& Li, 2021). On the other hand, traditional concerns (such as the digital divide) also remain in regard to the access of information technology (Barnes, 2020).

The resources form ICTs have become ubiquitous around the world (Chu, Luo, & Chen, 2019), recreating dynamics through mobile technologies (Dey, Yen, & Samuel, 2020). Considering the educational area, the popularity of mobile devices, such as smartphones and tablets, affected the perception of print publications (Jin, 2014). Together with technology development, the Internet generates some effects in the education and in the sources that students use to obtain information (Crespo et al., 2011). One innovation recently available to students, and for people in general, is the electronic book, or e-book.

The definition of e-book in this study follows the study of Jin (2014), that an e-book is a book publication in digital form, readable on computers or electronic devices. New individuals interested in e-books are emerging every day (Weinstein, 2010). E-book users also claim for features related to usability and interaction, in order to improve user experience when reading (Crespo et al, 2011).

Considering the lockdown limitations during the COVID-19 pandemic and the many actions to reduce human contact, we aim to test the effect of culture on e-book popularity among different countries. To do so, firstly, we compare the popularity of e-books during a period with lockdown orientations across the world with e-book popularity 12 months before, when there were not lockdown limitations. We developed this analysis with data from 116 countries. Secondly, we tested some potential determinants of the increase in e-book popularity. Since we have a database at a country level, in this second stage of analysis, the cultural dimensions of Hofstede were employed to understand an increase/decrease in e-book popularity.

There are many studies on e-books adoption that consider, for example, the Technology Acceptance Model (Davis, 1989; Jin, 2014). Therefore, this study can expand previous literature by considering an external factor of the environment that can affect the use of e-books. As, ICTs resources have gained popularity across countries, and cultural environments have been an important variable to understand the success/failure of many projects (Chu et al., 2019), we also highlight the role of cultural dimensions of Hofstede to better understand the adoption of e-books across different countries.

2. LITERATURE REVIEW

Hofstede's cultural dimensions have supported many cross-cultural studies in the field of information systems, since it represents a parsimoniously cultural dimension framework (Chu et al., 2019). Hofstede proposed four dimensions of culture: Power Distance, Uncertainty Avoidance, Individualism/Collectivism, and Masculinity/Femininity; the countries covered by the analysis could receive a score for each dimension (Hofstede & Bond, 1984). In more recent work, two other dimensions were included in Hofstede's Framework: Long/Short Term Orientation, and Indulgence/Restraint (Hofstede, 2011).

Extant literature indicates that besides technology factors and personal factors, technology adoption also depends on environmental factors such as culture (Panigrahi et al., 2018). Previous studies point that culture may influence adoption of digital innovations such as e-commerce (Hallikainen & Laukkanen, 2018), e-learning (El-Masri & Tarhin, 2017), mobile systems (Lee et al., 2007; Choi et al., 2014), games (Pyae, 2018), among others.

The studies of Lee et al. (2007) and of Abbasi et al. (2015) indicate that a propensity to individualism have a significant impact on technology adoption. Lee et al. (2007) argue that individualistic people value technologies and services that can be customized according to their needs more than people with collectivist tendencies. Individualism also increases the probability that the individual will perceive technology as useful for self-interests (Abbasi et al., 2015).

In the context of e-commerce, Hallikainen and Laukkanen (2018) point that masculinity positively affects the perception of trustworthiness of online stores. Kaba and Osei-Bryson (2013), state that in masculine societies, technology adoption is more likely to be based on a cost / benefit balance than on feminine cultures. Thus, the relationship between perceived usefulness and technology adoption is stronger for countries with higher levels of masculinity, which means that individuals in these countries tend to adopt technologies if they perceive them as useful (Kaba & Osei-Bryson, 2013).

According to Nistor et al. (2013), members of cultures with higher levels of power distance are less likely to use educational technologies. Assuming that an individual's cultural orientation can influence any belief and

perception regarding IT use, Hwang and Grant (2011) identified that the distance of power has a significant and negative effect on computer self-efficacy, which, in turn, influences the perception of ease-of-use of ERP systems.

Regarding uncertainty avoidance, studies point that it is a cultural factor related to risk perception and, consequently, to resistance to the use of technologies (Hwang & Lee, 2012; Hallikainen & Laukkanen, 2018). Potnis et al. (2018) point that the uncertainty associated with the use of e-books negatively affects the intention to use these electronic resources. Thus, the authors emphasize the relevance of supportive initiatives taken by librarians to mitigate uncertainty related to e-books adoption.

Therefore, we consider the Hofstede's cultural dimensions to improve the understanding of e-books popularity during pandemics. However, due to the absence of data for many countries of the study sample, only the initial four dimensions were considered in the quantitative analysis of this study.

3. DATA AND METHODS

The main purpose of this study is to test the effect of culture on e-book popularity among different countries during lockdown periods due the Covid-19 pandemic. To achieve this purpose, we used only public downloadable data. First, we collected data related to e-book popularity using Google Trends (Google, 2020); this variable was called E-Book Index. It represents the search interest for a given term in a given region/time, where a value of 100 indicates the peak of popularity; it ranges from 0 to 100 (Google, 2020).

In this first stage, using Google Trends, we downloaded the E-Book Popularity, by country, in the past 5 years. This information is available to download in weeks. Based on this data, we calculate the average popularity achieved by the term "ebook" in the months of April, 2020 and April, 2019. Therefore, we created two proxies for the dependent variable: i) E-Book Index, that represents the average popularity of e-books in Abril, 2020, by country; and ii) E-Book Index (Diff), that represents the difference between the average popularity in April, 2020 and the average popularity in April, 2019, by country. This comparative variable enables an analysis related to an increase in E-Book Popularity in relation to the same country and in the same month, but one year before. We collected this information in late July, 2020.

The second stage of data collection involved the variables for culture. To do so, we consulted Hofstede's website (Hofstede, 2020) and filled a spreadsheet with the values for each cultural dimension and country. The study of Hofstede includes six dimensions for culture; however, considering that many countries presented missing values for two of these dimensions (Long Term Orientation and Indulgence), this study considers the other four dimensions in the quantitative analysis: Power Distance; Individualism; Masculinity; and Uncertainty Avoidance.

Finally, we included some control variables in the quantitative model based on open data from The World Bank (2020). These control variables are related to country size (Population) and technology access (Mobile Cellular Subscriptions per 100 people). The variable Population (code: SP.POP.TOTL) represents the count for all residents in the country and refers to the estimative for 2019. For that countries with missing value in this variable, we considered the population of 2018 or 2017 (the most recent available). Regarding the technology variable, Mobile Cellular Subscriptions per 100 people (code: IT.CEL.SETS.P2) represents "subscriptions to a public mobile telephone service that provide access to the PSTN using cellular technology" (The World Bank, 2019). The most recent information on Mobile Cellular Subscriptions refers to 2018; for those countries with missing value in 2018, we considered the value of 2017 in this variable.

We employed the multivariate regression analysis to test the hypotheses. To avoid concerns with outliers and to eliminate the effect of scales, we calculated the natural logarithm of the variable Population. In both models, we also considered robust standard errors in order to avoid eventual concerns related to heteroscedasticity. All tables for the multivariate regressions report the Variance Inflation Factor statistics, which enables the evaluation of multicollinearity issues between the independent variables.

4. RESULTS

After consulting three large different sources of data, we elaborated the Table 1, that summarizes the descriptive statistics of the variables. On average, the E-book Index was 39.3 on April, 2020, ranging from 0.0 (the minimum) to 87.3 (the maximum value). It is important to note that the variable E-book Index (Diff) was 8.9 on average. This result indicates that, on average, the popularity of E-books increased by 22% in comparison to the same period, one year before. The descriptive statistics also indicates that a half of the countries in the sample (p50) have more than one mobile cellular subscription per person.

Table 1: Descriptive statistics of the variables

Variables	N	mean	sd	min	p10	p25	p50	p75	p90	max
E-book Index	116	39.3	20.9	0.0	13.0	23.3	36.8	51.5	73.3	87.3
E-book Index (Diff)	116	8.9	16.2	-59.5	-8.0	0.1	6.8	18.4	29.3	50.5
Power Distance	116	66.7	20.7	11.0	35.0	55.5	70.0	80.5	92.0	100.0
Individualism	116	37.3	21.3	6.0	15.0	20.0	30.0	52.0	71.0	91.0
Masculinity	116	47.1	17.7	5.0	20.0	40.0	46.5	58.0	68.0	100.0
Uncertainty Avoidance	116	66.5	21.6	8.0	38.0	50.0	68.0	86.0	93.0	100.0
Mobile Cellular Subsc.	116	117.6	31.5	37.2	87.6	98.4	118.5	133.6	147.2	270.0
Population (LN)	116	16.5	1.6	12.8	14.5	15.4	16.3	17.6	18.5	21.1

Notes: E-book Index = represents the average popularity of e-books in Abril, 2020, by country; E-Book Index (Diff) = represents the difference between the average e-book popularity in April, 2020 and the average e-book popularity in April, 2019, by country; Power Distance, Individualism, Masculinity, and Uncertainty Avoidance = represent the four cultural dimensions of Hofstede; Mobile Cellular Subsc. = Mobile cellular subscriptions per 100 people; Population (LN) = represents the natural logarithm of the count for all residents in the country.

After observing the descriptive statistics, we employed a t-test to evaluate the increase in E-book index. The result indicated that the difference between the indexes (8.9) was statistically significant at 0.01 (t = 5.9496; d.f. = 115). Such result is consistent with the consideration that the lockdown restrictions have increased the popularity of e-books among the countries of the sample. This result also suggests that Covid-19 affected the voluntariness to adopt some kinds of technologies, since a mandatory context (Venkatesh et al., 2003) can affect ICTs adoption. In the case of this study, we suggest that Covid-19 forced users to find alternative tools in relation to traditional books, and e-books gained attention during the lockdown periods.

Appendix A indicates that two dimensions of culture presented a significant relationship with e-book popularity: Power Distance, with a negative effect, and Masculinity, with a positive effect. This first model (Appendix A) explains 36.22% of the variability in e-book popularity on April, 2020. Regarding the increase in e-book popularity (E-Book Index Difference), the second model (Table 2) explains 21.69% of its variability. In this second stage of analysis, the same cultural dimensions were statistically significant, as well as the control variables (when compared to the results available in Appendix A).

Table 2: Results for the multivariate regression analysis (dependent variable: E-Book Index Difference)

Variables	Coef.	Rob. Std. Err.	t	P>t
Power Distance	-0.169	0.084	-2.020	0.046
Individualism	0.072	0.079	0.910	0.363
Masculinity	0.129	0.062	2.100	0.038
Uncertainty Avoidance	0.042	0.069	0.600	0.549
Population (LN)	3.194	0.781	4.090	0.000
Mobile Cellular Subsc.	0.127	0.050	2.540	0.012
Constant	-58.981	17.948	-3.290	0.001
Adj. R2	21.69%			
N	116			

Notes: Mean VIF = 1.36; Maximum VIF = 1.92. Power Distance, Individualism, Masculinity, and Uncertainty Avoidance = represent the four cultural dimensions of Hofstede; Mobile Cellular Subsc. = Mobile cellular subscriptions per 100 people; Population (LN) = represents the natural logarithm of the count for all residents in the country.

Countries where individuals are willing to accept an unequal amount of authority among inhabitants (Hofstede & Bond, 1984) tend to present lower levels for e-book popularity during pandemics. This result is consistent with previous research (Nister et al., 2013; Hwang & Grant, 2011). Education is an essential ingredient to achieve development and equivalent rights, so the disparity in e-books popularity suggests the existence of barriers in these countries to achieve a better level of development.

Moreover, countries more oriented to values related to success and money (Hofstede & Bond, 1984) tend to value e-books more than their counterparts, since the effect of masculinity dimension was positive and significant. This result is also in line with other studies (Kaba & Osei-Bryson, 2013; Hallikainen & Laukkanen, 2018) and allows an advancement in the field, since we are addressing an increase in e-book popularity during pandemics.

The individualism and the uncertainty avoidance dimensions did not affect e-book popularity according to the quantitative analysis. This result complements previous research (Lee et al., 2007; Hwang & Lee, 2012; Abbasi et al., 2015; Hallikainen & Laukkanen, 2018; Potnis et al., 2018) that highlights a relationship between ICTs and such dimensions-related culture.

Additionally, the results from Table 2 (and Appendix A) indicate that e-books popularity seems to be higher in large countries, and in countries that have more cellular subscriptions. In other words, countries where individuals have large index for cellular subscriptions also tend to present a higher popularity for e-books. This figure is equivalent when we consider the increase in e-book popularity during pandemics. Moreover, these results suggest that the diffusion of mobile devices can contribute to the adoption of e-books.

5. CONCLUSION

Considering the factors related to ICTs use (Albertin & Albertin, 2012), the Coronavirus pandemic can be viewed as an external event that affected the businesses and individual environments, generating an indirect incentive to adopt new technological resources. Even indirectly, some technological resources gained value with this new environment. A strong movement to digitalization started. In the case of e-books, both individuals and publishers perceived an extra-value in electronic books during the period. For individuals, this value may be related with flexibility to access and read books without the need of going to a physical library. For publishers, the new scenario probably increased the sales and the interest in buying and sharing e-books. These arguments are consistent with our results, since the popularity of e-books increased during the lockdown restrictions.

As commented in the introduction of this study, interaction and usability (Crespo et al., 2011) are important features related to e-books usage. Observing that e-books popularity increased during the lockdown period, a new research avenue could explore the role of usability and interaction to keep new e-book customers, especially for first time users. The isolation measures changed the relationship that individuals have with information technology. However, after these measures, will the popularity of e-books decrease around the world? Two concurrent hypotheses can guide new studies: e-books will continue popular among individuals, since the interaction between individuals and ICTs was changed; and the hypothesis that people will prefer to consult physical books as soon as it is possible again.

Moreover, the results of this study suggest other questions to be considered in further research. For example: is e-book popularity during isolation periods related to some kind of solidarity by book publishers? Will this solidarity be reverted in a change of habit? An equivalent behavior was also observed in the electronic commerce? Will this effect be similar in the future, for other products and services? Further research can address these topics and expand the result of this study.

The main results of this study indicate that electronic books gained popularity during the lockdown period. Mobile device developers and companies that market e-books (Jin, 2014) can consider the results of this study to design strategies to expand the use of electronic books and contribute to their access when the world faces difficult situations, such as the pandemics.

Since the cultural dimension presented an effect in e-book popularity, future research can also study the effects of acculturation and the global consume culture (Kizgin et al., 2020) on the use of electronic books.

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Appendix A:

Results for the multivariate regression analysis (dependent variable: E-Book Index 2020)

Variables	**Coef.**	**Rob. Std. Err.**	**t**	**P>t**
Power Distance	-0.241	0.109	-2.210	0.029
Individualism	0.093	0.100	0.930	0.356
Masculinity	0.177	0.073	2.420	0.017
Uncertainty Avoidance	0.159	0.088	1.820	0.072
Population (LN)	5.888	1.115	5.280	0.000
Mobile Cellular Subsc.	0.192	0.045	4.240	0.000
Constant	-86.612	22.305	-3.880	0.000
Adj. R2	36.22%			
N	116			

Notes: Mean VIF = 1.36; Maximum VIF = 1.92. Power Distance, Individualism, Masculinity, and Uncertainty Avoidance = represent the four cultural dimensions of Hofstede; Mobile Cellular Subsc. = Mobile cellular subscriptions per 100 people; Population (LN) = represents the natural logarithm of the count for all residents in the country.

Use of Twitter Technology in Educational Learning

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Abstract
This paper explores the use of Twitter technology in educational learning and teaching in education system. The objectives of this study emphasizes on the contributions of Twitter to personal and educational learning experience, and its adoption for professional development in 21st century. Twitter technology was invented as a media outlet in 2006, to provide a unique kind of communication that allows only 140 numbers of characters. It is a technology that permits users to send and receive information on website, from mobile or computer-enabled internet. A Twitter requires a valid email address to sign up for an account and equally set up private profiles in line with the system command. Users share pictures, videos among other educational materials of what is happening in the world. Twitter is a social media platform that has drawn the attention of its users, especially the students and educators around the world. Secondary sources of data collection were adopted in the paper review. In spite of the short comings of Twitter technology, major findings revealed that the use of Twitter technology is becoming a common usage among students and professional development of educators across the world. Recommendations include the need for sustained campaign of the use of Twitter technology in institutions of learning across the world, especially in the developing countries, and the pedagogical adoption of Twitter for professional development of the future of education, as opposed to traditional method of teaching.
Keywords: Twitter, Twitter Technology, Twitter usage, Professional Development

Introduction

Twitter as an aspect of social media, is a major social network in the world. Twitter is a new channel of information dissemination that has continued to attract tremendous user growth since the invention of the technology in 2006 (Java, Song, Finin, & Tseng, 2007). Twitter is a technology that permits users to send and receive information on website, from mobile applications or through short message service (SMS) messages. A valid email address is the only thing that is required of an individual to sign up for an account and equally set up private profiles in line with the system command. Twitter invites users to share pictures, videos of what is happening in the world (Tang & Hew, 2017). As at 2015, twitter has more than 320 million users per month (Twitter, 2015).

Research on Twitter reveals that the uses of Twitter include, conversation and dialogue; collaboration and exchange; self-expression and self-communication; status updating and checking; information and news sharing; and marketing and advertising (Dijck, 2012).Tweets are simply comparable to blog posts, and it is characterized by simple use of phrase abbreviation, due to limited allowance on the amount of tweet (Omofonmwan,2012). Twitter creates opportunities to increase connectedness and relationships building (Gonzales, Vodicka& White, 2011). Twitter can change the perception of people and their relationships (Turkle, 2011). It is resourceful in posting short questions, messages, as well as sharing information such as reference to articles or books given as an assignment (Cohen &Duchan, 2012).

In recent times, twitter use has become an integral element of teaching and learning in the school system. Although Twitter is used for entertainment, it is mainly used for social exchange, information sharing and seeking, self-documentation and expression (Liu, Cheung, & Lee, 2010).According to Haythornthwaite (2016), twitter is a top tool which educators have opted to utilize in future classroom work than Facebook, among other tools of learning.

Besides large-scale public communication or information, personal communication is permitted, though, the tweet is limited to 140 characters (Omofonmwan,2012; Tang & Hew, 2017). Little attention has been given to Twitter use (Tang & Hew, 2017). However, an essential aspect of Twitter is that users are in control of their interactions and activities, especially on relevant issues of concern (Holmes, Preston, Shaw, & Buchanan, 2013). Twitter enables teachers to network beyond their immediate environment, share the required resources, and respond to requests for improved practice (Forte, Humphreys & Park,2012).

Few studies have underlined the negative dimension of incorporating Twitter in educational context which include, overexposure, inappropriate usage, reputation, addiction, information overload as well as on content and personal privacy (Cho & Rangel, 2017; Kinnison, Whiting, Magnier, &Mossop, 2017; Rinaldo, Tapp, &Laverie,

2011).Other obvious barriers to being able to transfer learning to new situations include, lack of foundational knowledge with which to build upon, not having a model that demonstrates how to incorporate new learning, and a lack of opportunities to practice new learning in a real life situation (Foley & Kaiser, 2013). In addition, some researchers have noted setbacks of using Twitter, irrespective of the strengths that Twitter appear to provide educators. According to Sauers and Richardson (2015), educators may be open to use Twitter based on their judgment of how others use it. While some educators may adopt and use Twitter due to incentives from the corporations. On the other hand, information adopted from Twitter use may provide the much needed informational materials essential for the students. Another setback is the use of social media to write unsuitable remarks (Butler, 2010), andamong other concerns which include cyberbullying, internet predators, sexual exploits, and violent contents (Manzo, 2009). Generally, Young (2010), noted that college students are comfortable using social media, since the media provides them the opportunity to make their voices heard in class without having to speak orally.

Despite that social media platforms were not designed to be incorporated in the educational system, their networking patterns and content sharing have made Twitter part of education and learning-related activities (Tess, 2013).All and sundry, involving elementary, high schools, higher institutions, as well as federal and state education agencies have actively incorporated various social media platforms (Jordan, 2017; Wang, 2016). In view of the foregoing, the focus of this paper is to ascertain how Twitter technology contributes to personal and educational learning experience, and how it enhances the adoption of Twitter technology for professional development in 21st century teaching.

Theoretical conceptualization and literature review

This paper is conceptualized and reviewed under the following sub-themes: understanding the efficacy of twitter technology use in educational learning; benefits of Twitter technology integration in classroom teaching and learning; professional development and technology adoption in teaching; and Twitter as a tool for professional development. The review of these concepts provides a clearer understanding the objectives of the paper.

Understanding the efficacy of twitter technology use in educational learning

The usefulness of Twitter is contingent upon the determination of both the educators and students to be involved in its usage, with expectations that are educationally driven. With a purposeful intention, students will be active participant in the Twitter-related activities that is accompanied with expected outcomes (Tang & Hew, 2017). Twitter is a social media platform that rapidly grew to the attention of its users, especially the students (Adnan &Giridharan, 2019). Twitter as an aspect of social media that help students in performing educational tasks in classrooms (Ebner, Lienhardt, Rohs, & Meyer, 2010). Twitter is useful for resource and information sharing to a wider audience of learners than the traditional classroom teaching methods (Goff, Jones, Toney, Nwomeh, Bauer, & Ellison, 2016; Kassens, 2014; Stephens & Gunther, 2016). In addition, people use Twitter to share ideas and thoughts with each other, including virtual content such as videos and other digital contents. It is regarded as a friendly source of communication for users (Adnan &Giridharan, 2019).

In recent times, Twitter is seen as a support for scholarly tool for communication for both informal and formal learning. In other words, scholars, students, and professionals in diverse academic cycle use the Twitter technology to connect and engage with peers and public to share relevant and discipline specific information that addresses academic interests and goals (Holmberg &Thelwall, 2014; Veletsianos&Kimmons, 2016).In the context of education, Twitter has been described to contribute to learning capabilities and communication (Bista, 2015; Carpenter, 2014; DeGroot, Young, &VanSlette, 2015), and thought to be useful in augmenting engagement and collaboration among teachers, peers and students (Desselle, 2017; Greenhalgh, Rosenberg, & Wolf, 2016; Osatuyi&Passerini, 2016).

Twitter usage permits multi-directional dialogue, free and independent discussion that is opposite to classroom situation that requires speech by request (Cohen &Duchan, 2012).Cohen andDuchan, (2012), asserts that the Twitter-related interaction permits the assessment of difficulties that may be encountered by students on a subject area, especially the introverted students who do not participate in class exercises to express themselves freely using Twitter technology, and to facilitate learning about their interests and phenomenon encountered in the course of study. According to Jefferis and Bisschoff, (2017), the in-built mechanism of Twitter suggests materials that may be of interest to users in the #Discover tab, suggest the user to follow in the network and the activities to view in the process.

Although Twitter messages are limited to 140 characters, Dunaway (2011) noted thatit is used to deliver instructional content, prove information literacy ideas and formulate critical thinking that explains social and political information, and enables students to perceive themselves as active agents in the creation of knowledge and information. According toClipson, Wilson and DuFrene(2012), other ways that Twitter benefits students by

raising their level of awareness of communication challenges accompanying social networks, enabling them to evaluate their areas of educational improvement.

Studies demonstrate that Twitter has positive effects on higher education and institutes, the learning of a particular subject matter and the college student engagement and grade (Aydin, 2014). In a study of educational relevance of Twitter and how it can impact on college student engagement and grades, Junco, Heiberger, and Loken (2011), found that the experimental group had a significantly greater increase in Twitter engagement than the control group, as well as higher semester grade point averages. The study also found that faculty and students were highly engaged in the learning process in a manner that transcended traditional classroom activities. Furthermore, the study revealed that Twitter could be used as an educational tool that can help to mobilize faculty and students into active participation.

With regards to the effect of Twitter on learning a particular subject, a study by Kassens-Noor (2012), found that Twitter usage is associated with potential opportunities and pitfalls to the e-learning community in higher education when compared with traditional teaching methods. The study revealed that Twitter can be used to provide instant feedback in lectures, in an out of class situation, although there are problems regarding privacy issues.In addition, Tyma (2011), noted that Twitter provides an additional channel for students to communicate in the classroom using technology which they are familiar. The usage implies freedom and cataloging of conversations in relation to class activities.

There is a blend of the home, university, and social lives of students in Twitter usage (Aspden& Thorpe, 2009). Twitter usage is a nonthreatening and decidedly nontraditional activity that can be employed to engage students in university-wide development (Aspden& Thorpe, 2009). For Elavsky, Mislan, and Elavsky (2011), the positive effects of using Twitter in a lecture course is an avenue for evaluating the impact of pedagogy and the potential of contribution to large lecture course dynamics. Twitter as a technological mediated communication of new media is a source of ideas for classroom discussion and activities (Veltsos&Veltsos, 2010). This is largely because Twitter combines elements of social networking with academic activities, especially as educators constructively guide students in the learning environment (Taranto &Abbondanza, 2009). The firm knowledge of twitter technology use in educational learning is accompanied by numerous benefit to teaching and learning. Thus, the following sub-theme will focus on the essential benefits to users as it relates to information dissemination, open participation and learning.

Benefits of Twitter technology integration in classroom teaching and learning

The students of the next generation cannot cope with traditional methods of teaching because these children belong to the information overload age where data is universal and information is accessible with a click of the mouse. The students have also developed the characteristics and information-age habits that are remarkably different from those students that were traditionally trained in the old days (Tadros, 2011). This is one of the reasons why Arnold and Moshchenko (2009), contend that it is vital for technology to be instilled in the curriculum in a children's early formal learning experiences in order to provide robust learning experiences. The early introduction of technology through computer technology begins at the elementary levels, from which the pupils grow with to the tertiary levels.

The benefits of technology integration in the classroom setting are enormous. The utilization of technology, enables students to learn things in the abstract through the use of simulations and games; permitting students to cooperate with others through distance learning opportunities; and providing students with the ability to dictate their learning pace (Bransford, Brown, & Cocking, 2000; Liu & Szabo, 2009). More so, through technological advancement in schools of learning, Darling-Hammond Banks, Zumwalt, Gomez, Sherin, Griesdorn, and Finn (2005), noted that the usage of video tools is an opportunity for students and teachers to reflect on their performances. Technology is also an opportunity for students to determine and pursue their own goals, and express in concrete terms their strengths, weaknesses and achievements (U.S. Department of Education, 2010). In other words, students' digital literacy is a must engagement, determining for themselves tools and services that support their learning goals (Beetham& Sharpe, 2013).

A study by Project Tomorrow (2009), revealed that some teachers have expressed interest in utilizing social network site (SNS) to teach their students. SNS builds relationships between teachers and students, and also a good way of fostering trust. Schroeder, Minocha, and Schneider (2010) noted that relational barriers are surmounted when students access each other's blogs and social networking profiles. For example, a study conducted by Hitlin and Rainie(2005), showed that most teens reported that access to internet improves their performance in school. This assertion underscores the contribution of Twitter to the knowledge and understanding school children from

the beginning of their education. This level of exposure is most likely to extend to adulthood, making Twitter essential for learning.

Contrary to technology-based learning, Scardamalia and Bereiter(1999), argues that traditional schooling hardly provides an opportunity for students to form their own knowledge and do not guarantee a better functioning in the world as a graduate. What students learn in school must reflect what they will encounter in the real world. Learning that facilitates communication among people, according to Jenkins (2009), is participatory culture. A culture that makes members of the society feel that their contributions matter and also have a sense of social connection with one another. For example, in Twitter, a hashtag (#) is occasionally used to gain feedback from computer users all around the world. As teachers and students communicate, feedbacks are expected. This implies that creating a participatory culture in schools can modify the traditional learning approaches from teacher-directed learning to student-centered learning(Jenkins, 2009).

Professional development and technology adoption in teaching

To implement 21st century learning in classrooms, teachers are expected to prepare students to succeed in today's competitive world, develop their own expertise with new learning and ever changing technologies (Killion, 2011).This implies that technology plays a vital role in the patterns of teaching in the 21st century. In recent times, some teachers do not recognize that modern day students have new sets of needs and expectations for learning that internet-based. That is to say that learning habits is ever changing, downplaying the traditional model of teaching and learning (Levin &Arafeh, 2002). In their study, Solomon, Allen,and Resta (2003) found that since most teachers teach in line with how they were taught, especially without the use of technology, it is difficult for these set of teachers to accommodate the value of technology in enhancing students' learning. It is important to note that Twitter technology allows people to learn at the same time outside the constraints of time and space, and also permits educators to transform the traditional ideas of professional development (Trust 2012). According to Trust (2012), this transition enables educators to become true life-long learners who nurture and share their expertise with others, and model this perpetual learning to students.

Technology is dictating the pace for communication and learning, as well as the learning principles and process, and changes in social environments (Siemens, 2005). The willingness to appreciate and demonstrate self-competence or innovativeness of teachers into the use of technology is through staff development (Marcinkiewicz, 1993). Teachers who find it difficult to adapt or adjust to technology in their teaching practices are likely not to have high commitment to continuous learning in the field of education (Riel & Becker (2000). Thus, educators that have adjusted to teaching and learning are more likely to engage students in higher-order thinking tasks compared with educators who are engrossed with traditional teaching patterns who are preoccupied with remedial, drill and practice types of learning (Kmitta& Davis, 2004). Palak and Walls(2009), argues that teachers who may not integrate technology to support student-centered practices lack models of technology to facilitate this type of learning.

A major setback in the professional development of teachers in technology usage is that in most cases, workshops for teachers are fragmented, episodic and short-term based, which offer little or no opportunity to integrate learning into practice (U.S. Department of Education, 2010). Mueller, Wood, Willoughby, Ross, andSpecht (2008), noted that with the exception of short-term focus of professional development, in most cases, the training approach revolves around a particular software. To address these challenges, Miranda and Russell (2011) propose that educational sector should promote professional development prospects thatrely on the benefits rather than the procedure of using instructional technology, and highlight instructional technology strategies used by teachers who use technology creatively and effectively.

What educators need is job that is accompanied with assistance as they attempt to adapt a new curricula and new instructional practices to new innovative classroom method (Guskey& Yoon, 2009). According to Plair (2008), teachers desire a constant support person in this unique area. In addition, Educators must model the use of various technologies for the K-12 and higher education classrooms, explain and demonstrate how these technologies are linked to and affect learning outcomes, and contribute toward meaningful learning (Edwards & Mosley, 2011).

Twitter technology adoption in teaching learning demonstrates its usefulness professional advancement of knowledge. Consequently, Twitter technology becomes a tool for professional development of educators. Owing to ever changing pedagogical dimensions, it is germane as a tool for development in the educational sector. This will form the focus of discussion in the next theme as foundational for the expected growth in education sector.

Twitter as a tool for professional development

Professional development refers to learning that progresses through stages of learning opportunities designed and administered by an external expert (Easton, 2008).Teachers from educational domains reported using Twitter for professional development than within classrooms, which reinforced commitment to work (Cho & Rangel, 2017; Greenhalgh et al., 2016; Visser et al., 2014; Wesely, 2013). However, research findings revealed that extended experiences of professional learning that are ongoing, rather than concentrated, are more beneficial (Bauer, 2010; King, 2011; & Reich et al. 2011). It is believed that real professional development should engage educators in learning that is both flexible and dynamic, take advantage of mentors in formal and informal methods of learning to improve teachers' awareness of their own practices, and philosophies, and weaknesses and strengths (Bauer, 2010; Kabilan, Adlina, &Embi, 2011).

Professional development of educators include those skills and knowledge acquired for personal and career advancement (Ross, Maninger, LaPrairie, & Sullivan, 2015). In contrast, Traditional methods of professional development include courses offered by school districts, universities, technical assistance agencies, professional associations, nonprofit organizations, and among others. However, it has been observed that these models of learning delivery, no longer provide meaningful learning experiences that is expected to enhance teachers professional competencies (Kabilan et al., 2011). According to Kabilan et al., (2011), the traditional professional development lacks the pedagogical content and structural characteristics needed in a dynamic world.

The use of Twitter is grassroots professional development Forte, Humphreys, and Park (2012). The effectiveness of professional development of educators could be enhanced by teaching of digital literacies and by exploiting the affordances of digital tools and social networking capabilities to join forces, plan with, and learn from other educators (Beach, 2012).

Somescholars argue that professional development should be school-based, located within classroom setting (Carpenter &Krutka, 2015), while others are seeking improved use of Twitter for professional development (Carpenter &Krutka, 2015; Visser, Evering, & Barrett, 2014).It is argued whether teacher education programmes have the in-built capacity to prepare future teachers to avail themselves the opportunity that social networking sites such as the Twitter have for their profession (Visser et al. 2014). This is because some scholars have found that Twitter is vital for teachers who are progressives, and have the capacity to build networks that can strengthen leadership in educational community (Forte et al., 2012). In other words, facts have been found to suggest that a community of practice on Twitter that is concentrated on the professional development of teachers supports learning in various ways (Wesely, 2013).

Learning is fundamental in understanding and responding to the changing world (Hammerness, et al. 2005). The life-long learning is essential for teachers who are not only expected to instill the value of learning to their students but also confront the challenges of developing their pedagogy in response to the ever-changing socio-cultural and economic environment they find themselves (Duncan-Howell, 2010). In this respect, it is vital that teachers engage in continuous update of their skills and knowledge through professional learning and development (Organisation for Economic Co-operation and Development, 2009).

The social media networking has generated new ways of professional learning, as a result has become popular among teachers in most part of the world (Alderton, Brunsell and Bariexca 2011; Forte, Humphreys and Park 2012; Grosseck and Holotescu 2011).It is normal that social media has provided an alternative avenue for the private and professional growth of educators Elias (2012).Duncan-Howell (2010) found that teachers generally regarded participation in online communities as a meaningful and relevant form of professional learning.

Furthermore, the nature of professional development arising from social networking sites such as Twitter is seen by the proponents as more democratic, collaborative, and accessible and absolutely free (Elias 2012). In other words, social networking is in contrast to traditional method of professional development narrow and top-down lesson creation and delivery (Rutherfod, 2010). In essence, teachers engage in professional development to formulate, implement, and share learned practices, knowledge and necessary values that meet the needs of students (Schlager, Fusco, Barab, Kling, & Gray, 2004)

Conclusion

Having explored the use of twitter technology in educational learning, it is pertinent improve on the campaign across many countries of the world, especially in the developing countries where people have not fully recognized the invaluable usefulness of Twitter. Twitter technology has proven to be resourceful for both teachers and students alike. More so, the pedagogical adoption of Twitter for professional development suggests what might be the future

of world of education, as opposed to traditional method of teaching. Therefore, twitter technology as a growing integral element in the schools system is adequate in the 21st century.

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