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Dear TOJDE Readers,

Welcome to Volume 24 Issue 3 of TOJDE

There are 19 articles and a book review in July 2023 issue. 53 authors from 10 different countries contributed to the issue. These countries are Greece, Indonesia, Nigeria, Philippines, Spain, Taiwan, Thailand, Turkiye, United Kingdom and Vietnam.

The authors of the 1st article are Ozlem UTKU BILICI, Gonca SUBASI and Emrah DOLGUNSOZ. The title of the article is THE EFFECTS OF STRATEGY TRAINING ON THE USE OF GLOBAL READING STRATEGIES: IMPLICATIONS FROM THINK-ALOUD AND EYE-TRACKING DATA. This study aimed to investigate the impact of strategy training on Turkish EFL learners' use of global reading strategies. The results are encouraging for the use of reciprocal teaching, one of the comprehensionenhancing approaches to teach reading, in the EFL contexts.

IMPACT OF SYNCHRONOUS ONLINE LEARNING ENVIRONMENT ON STUDENTS' COGNITIVE ENGAGEMENT AND LEARNING OUTCOMES is the title of the 2nd article. The purpose of this study was to investigate the effects of synchronous online learning environments on students' cognitive engagement, satisfaction, and academic achievement. The results indicate that pedagogical instructions have direct positive medium effects on both deep and shallow cognitive engagements; deep cognitive engagement has a direct positive impact on academic achievement while shallow cognitive engagement do not have any impact on academic achievement and satisfaction.

The title of the 3rd article is THE BIBLIOMETRIC ANALYSIS OF THE AUGMENTED REALITY RESEARCH CARRIED OUT WITH THE EXPERIMENTAL METHOD PUBLISHED IN SCOPUS BETWEEN 2012-2022. Hakan ALTINPULLUK and Yusuf YILDIRIM are the authors. This study aims to make a bibliometric analysis of the augmented reality articles carried out with the experimental method between 2012 and 2022 in the Scopus database. To realize the aim of the research, 255 articles published between 2012-2022 were reached. Obtained results within the scope of the research are shared by discussing with other study findings obtained from the literature.

The 4th article is written by Ojat DAROJAT, Olivia IDRUS and Lidwina Sri ARDIASIH. The title is DISRUPTIVE CHANGE AND LEARNING INNOVATIONS: CHALLENGES AND OPPORTUNITIES FOR UNIVERSITAS TERBUKA. According to this article, with an integrated learning management system and the number of alumni reaching up to 1.9 million, Universitas Terbuka is able to carry out the Indonesia's government mandate in opening the widest possible access to education for Indonesian citizens, both domiciled in Indonesia and abroad.

The title of the 5th article is DISTANCE EDUCATION STUDENTS' INDULGENCE IN SIX SHARP PRACTICES: GENERAL LINEAR MODELLING OF PREDICTIVE PARAMETERS. Valentine J. OWAN, Onyinye CHUKTU, Ann E. DIJEH, Abderrazak ZAAFOUR, Julius U. UKAH, Margaret U. CHUKWURAH, Denis A. UBE, Michael E. ASUQUO, Esuong U. UWASE, Udida J. UDIDA and Cyprian O. OJONG are the authors. This study examines the degree to which students indulge in six prominent misconducts in Distance Education Institutions. The study also quantifies how class size, instructional delivery and institutional policies predict students' indulgence in sharp practices using a general linear modelling approach. The authors discuss key policy and research implications in the conclusion.

Mustafa Tevfik HEBEBCI and Nilay OZER are the authors of the 6th article. The title of this article is BLENDED LEARNING IN HIGHER EDUCATION: A BIBLIOMETRIC ANALYSIS. This research aims to analyze the past literature on blended learning in higher education and investigate the research trends on this subject. Thus, it aims to present a roadmap for future studies. Discussions are conducted within the framework of the literature, and suggestions are made related to the findings obtained in the study.

The title of the 7th article is PROFESSIONAL LEARNING NETWORK ACTIVITIES OF INDONESIAN TEACHERS: DIFFERENTIAL ITEM FUNCTIONING ANALYSIS OF TEACHERS' BACKGROUNDS. The authors of this article are Wawan KRISMANTO, Punaji SETYOSARI, Dedi KUSWANDI and Henry PRAHERDHIONO. This research aims to investigate the level and differences

of activity of teachers when engaged in social mediabased professional learning network using a non-experimental quantitative design. The findings indicate that all teachers sampled have a moderate level of social media-based professional learning network activities.

EXAMINING ONLINE DESIGN STUDIO COURSE EXPERIENCES OF STUDENTS, ACADEMIC SUPERVISORS AND COMPANY MENTORS IN INDUSTRIAL DESIGN PROGRAM is the title of the 8th article. This article is written by Nilgun OZDAMAR, Fusun CURAOGLU, Emre TUFEKCIOGLU and Duysal TUTUNCU DEMIRBAS. The aim of this study is to share the experiences and the collaborations carried out within the sector during the pandemic period, in a graduation project which is focused on university-industry cooperation - in order to make the role of the designer in the sector more effective, to transform education into a comprehensive sectoral experience for students and to offer the sector the experience of working with the designer at Department of Industrial Design, Eskisehir Technical University. The result of the study indicate that pandemic opened the door to new educational experiences for design academics, students and companies.

The 9th article is written by Mai Thi Truc LE and Khue Van TRAN. The title of the article is SYNCHRONOUS VIRTUAL LEARNING STUDENTS' EXPERIENCE AND THE PROSPECT IN VIETNAM. The purpose of the study is to examine students' learning experience with Google Meet, a virtual learning tool in tertiary contexts in Vietnam. Based on the results, pedagogical strategies are implicated to maximize the effectiveness of virtual classes.

The 10th article is titled TAKING THE PICTURE OF INFORMAL DIGITAL LEARNING OF ENGLISH (IDLE) IN A HIGHER EDUCATION TURKISH EFL CONTEXT by the authors S. Ipek KURU GONEN and Yeliz KIZILAY. This study aims to present Informal Digital Learning of English practices of higher education Turkish English as a Foreign Language learners in detail and investigate the motivations of these learners considering their actual endeavors with digital language learning sources. This study has certain implications and suggestions for language practitioners and teachers to foster Informal Digital Learning of English practices.

Hue NGUYEN is the author of the 11th article and the title is PERCEIVED SUPPORT FROM INSTRUCTOR & PEERS AND STUDENTS' SELF-REGULATED LEARNING DURING TEMPORARY ONLINE PIVOTED LEARNING. The study explores the impact of instructor support and peers support on students' self-regulated learning during temporary online pivoted learning. The research suggests that educators and institutions should provide adequate support for students and facilitate interactive online learning environments for peer-to-peer support.

Kemal NAZLI and Ali CULHA are the authors of the 12th article. The title is REFUGEE STUDENTS IN OPEN AND DISTANCE LEARNING DURING THE COVID-19 PANDEMIC THROUGH THE EYES OF TURKISH TEACHERS. This study is conducted to identify the problems faced by refugee students during Covid-19 pandemic in open and distance learning and the best examples of practices put into effect to cope with these problems cope and solutions recommended to eliminate these problems, in Turkiye. According to the study findings, the refugee students who do not have the necessary educational technology facilities in open and distance learning process and cannot get sufficient family support feel more deeply the language problems which is experienced also by them in face-to-face education.

Hany FARISA, Dyah SUNGGINGWATI and Susilo SUSILO are the authors of the 13th article titled TEACHERS' COMPETENCIES AND STUDENTS' ATTITUDES TOWARD ICT AT AN EFL SECONDARY SCHOOL. This study explores teachers' competencies of information and communication technologies in their teaching and students' attitudes toward information and communication technologies in learning English. Three English teachers and their 90 students of eleven graders at one secondary school in one district in East Kalimantan participated in this study. The results suggest that English teachers need to have more professional development programs related to information and communication technologies in order to understand and be able to operate the information and communication technologies media and tools to teach English. English as a Foreign Language students should aware of their attitude toward information and communication technologies in this modern era and firmly use the advancement of information and communication technologies for educational purposes.

The title of the 14th article is THE EFFECTS OF USING FLIPPED CLOUD LEARNING WITH ADVANCING MATHEMATICAL THINKING APPROACHES ON UNDERGRADUATE STUDENTS' MATHEMATICAL CRITICAL THINKING and the authors are Benjamas CHIMMALEE and Anuchit ANUPAN. In this study, flipped cloud learning, incorporating approach of advancing mathematical thinking, are conducted in Mathematical Analysis course to study students' mathematical critical thinking. According to study, integrating strategy for advancing mathematical thinking into flipped cloud learning positively affect students' mathematical critical thinking. The results also suggest that this reformed learning approach might be usefully employed as an instruction model in the new normal context.

Dilara KESKIN is the author of the 15th article and the title is IMPLEMENTATION OF FLIPPED MODEL IN EFL READING CLASSROOMS. This study presents some tools to provide teachers an idea of how to flip a language classroom and make the learning process more active and communicative. The results reveal that English as a Foreign Language students had positive attitudes towards flipped classroom. Additionally, online assignments and discussion tasks were found to be useful for the implementation of flipped classroom in English as a Foreign Language reading classroom courses.

The 16th article is written by Christopher H. PUNZALAN and Roberto L. RODRIGUEZ JR. The title is ONLINE BIOCHEMISTRY DISTANCE LEARNING: DENTISTRY STUDENTS' PERCEIVED OPPORTUNITIES AND CHALLENGES. This study works to help solve the issues and concerns related to teaching biochemistry as a foundational course for dental and other health-sciences programs in the status of the educational system. The researchers appeal to future researchers and policymakers to anchor forthcoming steps to further augment the online teaching and learning experiences of teachers and learners.

Hatice Saliha CUKUR is the author of the 17th article titled TECHNOLOGY INTEGRATION BELIEFS AND PRACTICES OF TURKISH NOVICE EFL TEACHERS AFTER ONLINE PRACTICUM. This study aims to investigate how novice teachers' online practicum affects their teaching with technology in face-to-face classrooms. The findings reveal that teacher education programs should offer updated content and opportunities for creating digital material to prepare EFL teachers for the future.

The 18th article is authored by Dimitrios GKOROS and Aikaterini PAPAGEORGIOU. The title is PRESCHOOL EDUCATION AND DISTANCE EDUCATION: TEACHERS' OPINIONS ABOUT PRESENT STATUS AND FUTURE POSSIBILITIES. The present study attempts to investigate the intergration of distance education in preschool education in the future as well as the factors that promote or inhibit it, by examining the views of kindergarten teachers. According to this study, issues such as teachers' technological readiness, technological equipment and parental involvement need to be addressed.

The title of the 19th article is EFL TEACHERS' VOICE ON THEIR PREFERRED STRATEGIES IN TEACHING EFL WRITING DURING THE PANDEMIC: INVESTIGATING THE ROLE OF TECHNOLOGY. The authors are Bambang Yudi CAHYONO, Faizatul ISTIQOMAH, Ima FITRIYAH and Imelda GOZALI. This study endeavored to gain insights into English as a Foreign Language preferred strategies in teaching English as a Foreign Language writing during the pandemic, particularly dealing with technology use. According to study, It is recommended that the government and educational institutions provide support in terms of infrastructure, facilities, and professional development training in technology usage for teachers, especially for those who teach in remote regions

There is a book review in this issue. The title of the book is ONLINE LANGUAGE LEARNING: TIPS FOR TEACHERS. This book is written by Laurence MANN, Jieun KIAER, and Emine CAKIR. The reviewer is Antony HOYTE-WEST.

Hope to meet you in the next issue of TOJDE.

Cordially,

Dr. T. Volkan YUZER

Editor in Chief

THE EFFECTS OF STRATEGY TRAINING ON THE USE OF GLOBAL READING STRATEGIES: IMPLICATIONS FROM THINK-ALOUD AND EYE-TRACKING DATA

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ABSTRACT

Considering the critical role of reading strategies in L2 reading this study aimed to investigate the impact of strategy training on Turkish EFL learners' use of global reading strategies. 23 freshmen, enrolled in the ELT Department, participated in the study, and the data were collected through eye tracking and think-aloud protocols. The results are encouraging for the use of reciprocal teaching, one of the comprehension-enhancing approaches to teach reading, in the EFL contexts. Eye tracking results, hand in hand with the think-aloud protocols' findings, revealed that the participants utilised global reading strategies more frequently to a statistically significant degree after the strategy instruction. Thus, it was concluded that strategy training was useful for the participants to improve their use of global reading strategies, and a recent technological tool can be purposefully integrated into the data collection procedure of educational research studies. Pedagogical implications on the strategy training for the employment of global reading strategies that would help students improve reading skills need to be given attention by teachers.

Keywords: Reciprocal teaching, global reading strategies, eye tracking, reading in L2, tertiary Turkish EFL students.

INTRODUCTION

A learner can find a variety of ways to enhance his or her learning and making use of enhancement strategies can be effective in increasing learner autonomy. However, unless learners are aware of what learning strategies are, and how they can get the benefit of them, developing and sustaining autonomy might be highly challenging. Therefore, strategy instruction has been suggested with the aims of increasing learners' metacognitive awareness of learning strategies (Alrabah & Wu, 2019; Annury, Mujiyanto, Saleh & Sutopo, 2019; Ashadi, 2019; Aziz, Nasir & Ramazani, 2019; Carrell, 1989; Deliany & Cahyono, 2020; Kung & Aziz, 2020; Kusumawardana & Akhiriyah, 2022), promoting learner autonomy as well as learners' self-esteem

and self-efficacy (Hong-Nam & Leavell, 2011), fostering critical thinking (Mohseni, Seifoori & Ahangari, 2020), and specifically improving learners' reading comprehension skills (Alfassi, 2004; Alshammari, 2022; Altahap, 2022; Dole, Brown & Trathen, 1996; Sporer, Brunstein & Kieschke, 2009).

As a method allowing learners to actively participate in the process of comprehending reading materials, reciprocal teaching (Palinscar & Brown, 1984; Puspita & Nuroh, 2022) helps learners to internalise reading strategies. The four components of reciprocal teaching "predicting, questioning, summarising, and clarifying" also constitute global reading strategies (Mokthari & Reichard, 2002, p. 252), and they can function as both "comprehension-fostering and comprehension-monitoring activities if used properly" (Palincsar & Brown, 1984, p. 121). Besides, it is suggested that strategy instruction through reciprocal teaching results in successful outcomes, which can be attributed to "the particular strategies trained, to the reciprocal teaching procedure, or to a combination of both" (Palincsar & Brown, 1984, p. 168). Considering that fluent readers' most common purpose for reading is "to read for general comprehension" (Grabe, 2009, p. 10), the importance of developing strategic reading to facilitate reading comprehension can be clearly understood. More precisely, as it was noted by Koda (2005, p. 221), "strategic reading is an essential competence for anyone reading for the purposes of thinking and learning' and learners' being aware of their own capabilities in terms of reading and comprehending a text ensures successful comprehension.". Similarly, Garner (1987, p. 50) argues that reading strategies, which are "generally deliberate and planful activities undertaken by active learners, many times to remedy perceived cognitive failure" by her own definition, have facilitative effects on reading comprehension, and they can be taught as well. This statement is also in line with Mohseni et al.'s (2020) views since they pinpoint that "reading comprehension is not an acquired skill and entails instruction" (p.2) and they further emphasise the need for the most effective instructional approach in teaching reading. As Par indicates in his study (2020, p. 227) "reading strategies may cultivate reading skills through frequent practice and use".

In this connection, it can be noted that guiding learners to make them efficient reading strategy users can make them better comprehenders and readers. Additionally, if participants are informed about the possible benefits of utilising reading strategies, learner autonomy, self-esteem and self-efficacy can be supported as well. Taking the facilitative effects of strategy instruction into account, the present study aimed to examine the efficacy of strategy training, which was conducted through reciprocal teaching, by carrying out think-aloud protocols and utilising eye tracking.

Definitions of the Key Terms

Reciprocal teaching is a method proposed first by Palincsar and Brown (1984). Four comprehension strategies are emphasised in this method: predicting, questioning, clarifying, and summarising. The teacher models the sequence and the process, then encourages learners to be the leaders guiding the process. Each student takes a role in turn and accordingly, makes predictions on the text to be read, asks questions to comprehend the text better and more efficiently, clarifies the unclear points or summarises the text.

1. *Summarising:* It can be regarded as the ultimate outcome of reciprocal teaching process because learners are expected to make a summary of what they comprehend after they put forward predictions on the content of a text, pose questions related to the incomprehensible parts and clarify them. Moreover, to summarise the information, "learners need to analyse the text globally" (Cotterall, 1990, p. 56), and to verbalise what they understand, they are supposed to put main ideas in their own words, which means first recognising and rewording them by paraphrasing. Therefore, summarising can be described as a strategy that enfolds the other three strategies.

2. *Questioning:* Putting questions related to the reading material provides opportunities for learners to take charge of comprehension process – that is to say, since they themselves generate questions, "they can become much more involved than they do when answering questions of the teacher" (Palincsar & Brown, 1986, p. 772). Therefore, encouraging learners to discover the points they do not understand well enough to comprehend the text and to pose questions about these points will make them more efficient readers and better comprehenders. Additionally, by doing so, learners can evaluate themselves, "which facilitates self-testing" (Meyer, 2010, pp. 43-46).

3. *Clarifying:* Once learners generate questions about what they do not understand at all, they need to find clear explanations to comprehend the text and to fulfil the tasks meaningfully. Clarification process can be led by the leader. However, the point is that all the learners should get involved in the process because there may be some learners who indeed do not understand well. Moreover, they have certain difficulties in comprehending the text and believe that "the purpose of reading is saying the words correctly" (Palincsar & Brown, 1986, p. 772), and bringing them on to read may be possible by making them involved in the process. Learners should be encouraged to use "contextual clues, tables, figures, pictures and typographical aids like bold face and italics to both increase understanding and identify key information" (Mokhtari & Reichard, 2004, p. 393).

4. *Predicting:* The underlying aim of directing learners to make predictions about the text can be to activate learners' background knowledge about the topic of the text. Once a learner has brought to his or her mind an awareness of what is already known about a subject matter, the reading text can be comprehended more consciously, which enables him or her to focus on problematic points more easily. Because learners' schemata can be activated suggesting predictions on a specific topic, the reading process becomes more meaningful and purposeful as well. Furthermore, making predictions enables learners to "draw certain inferences related to the given texts and make use of them while reading" (Oczkus, 2013, p. 35).

Global reading strategies are the strategies determined clearly in Mokhtari and Reichard's (2002) study. They developed an inventory to evaluate readers' metacognitive awareness of reading strategies. The inventory consists of three main types of reading strategies: global reading strategies, problem-solving strategies, and support reading strategies. However, in the current study, use of global reading strategies, which can be listed as follows, are examined specifically: setting purpose for reading, activating prior knowledge, checking whether text content fits purpose, predicting what text is about, confirming predictions, previewing text for content, skimming to note text characteristics, making decisions in relation to what to read closely, using context clues, using text structure, and using other textual features to enhance reading comprehension.

Eye tracking is a technology that enables researchers to examine eye movements of the participants by using a device named as eye tracker. With recent developments in technology and important advancements in eye tracking, now it is quite possible to utilise this technology in the field of language teaching, too.

REVIEW OF LITERATURE

Several studies have been conducted to investigate whether reciprocal teaching is efficient in improving reading comprehension of learners with reading disabilities (Al-Qahtani, 2021; Bruce & Chan, 1991; Gersten, Fuchs, Williams, & Baker, 2001; Klingner & Vaughn, 1996; Lysynchuk, Pressley, & Vye, 1990) and to examine the efficacy of reciprocal teaching in different grades (Doolittle, Hicks, Triplett, Nichols, & Young, 2006; Gilroy & Moore, 1988; Gruenbaum, 2012; Kelly, Moore & Tuck, 1994; Puspita & Nuroh, 2022; Satriani, 2022; Slater & Horstman, 2002; Westera & Moore, 1995). The common aim of these research studies was to explore how strategy instruction, carried out through reciprocal teaching, affects learners' reading comprehension and use of reading strategies.

To illustrate, in the study of Sporer et al. (2009), strategy instruction was carried out in four different ways, and it was aimed at discovering their effects on 210 elementary-school students' reading comprehension skills and strategy use. The results indicated that the reading comprehension skills and strategy use of the participants in the reciprocal teaching group improved more, when compared to those in the instructor-guided reading condition and the control condition. Thus, it can be concluded that traditional reciprocal teaching has facilitative effects on improvement of reading comprehension and strategy use, which likewise was concluded in the study of Doolittle et al. (2006).

In a similar vein, Lysynchuk et al. (1990) carried out an experimental research study with 72 Grade 4 and 7 poor comprehenders. Both daily assessment tasks and a standardized reading comprehension test were used to investigate whether reciprocal teaching would be more successful in fostering the participants' reading comprehension. The results were consistent with the original reciprocal teaching research study of Palincsar and Brown (1984) and that of Sporer et al. (2009), so the fact that reciprocal teaching can be effectively used

to enhance reading comprehension and strategy use of learners with reading disabilities has been supported with the findings of Lysynchuk et al.'s (1990) study.

Another study, substantiating the efficacy of reciprocal teaching, is Salataci and Akyel's (2002) study. As a research study conducted with 20 Turkish EFL learners, enrolled in a pre-intermediate level class of a one-year intensive English course, this study aimed at exploring learners' use of reading strategies both in Turkish and English and examining how strategy instruction affected reading in Turkish and English. The participants were exposed to 4-week strategy instruction, and it was found out that strategy training carried out through reciprocal teaching was useful to facilitate the use of predicting, summarizing, and using background knowledge strategies.

As a recent study in the field, Satriani (2022) investigated the effect of reciprocal teaching strategies on students' reading comprehension by teachers. The findings of the study reveal that using the reciprocal teaching strategy enhances reading comprehension, in turn, it is considered to be an appropriate and alternative method in teaching reading. The other recent research study has been conducted by Puspita & Nuroh (2022) in the Indonesian context to examine the perspectives of teachers utilising reciprocal strategy for teaching reading. The outcomes of the study yield that these strategies foster students' comprehension due to the fact that teachers guide students in grasping the entire text by developing effective skill such as summarising, questioning, clarifying, predicting, and responding what they are learning. In short, these two studies highlight the significance of "reciprocal teaching strategies" to help students master reading.

The aforementioned studies examining the possible effects of strategy training cannot be underrated. However, only Prichard and Atkins (2016) utilised a recent technology tool besides common data collection tools to discover if learners use a global reading strategy, namely previewing a text, while reading in L2. With the integration of eye tracking into the data collection procedure, they gave a new impulse to data collection, and the results revealed a lack of previewing strategy use. However, what they utilised in obtaining data is extremely encouraging for researchers who aim to combine commonly preferred data collection instruments with recent technological equipment.

RESEARCH QUESTIONS

A study combining strategy instruction and eye tracking technology may provide useful outcomes regarding the practical implementation of a recent technological tool within an educational research study because despite its being an innovative recent study, no strategy instruction was implemented in Prichard and Atkins's (2016) study. Thus, the present research study aimed at examining the possible effects of strategy training, which was carried out by adopting the reciprocal teaching method, on improving participants' use of global reading strategies through think-aloud protocols and eye tracking and in accordance with this purpose, the following research questions were determined:

1. What is the effect of strategy instruction on the learners' attention during text processing regarding titles, introductory paragraphs, and image areas?
2. What is the effect of strategy instruction on the learners' perceived use of global reading strategies?

METHOD

Research Design

John W. Creswell and J. David Creswell (2018, p. 44) define mixed methods research as "an approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks" and they propose four main types of mixed methods designs (i.e., convergent, explanatory sequential, exploratory sequential, and complex). The present study is designed as explanatory sequential mixed methods research because it is aimed to "have a more in-depth understanding of the quantitative data collected in the first phase of the data collection procedure" (Creswell & Clark, 2017, p. 135); hence, the overall purpose of employing this specific research design is to "explain quantitative results with qualitative data" (Creswell & Creswell, 2018, p. 372).

Participants

To determine the participants of the present study, a reading proficiency test was administered in the first week of the 2018 – 2019 Academic Year Fall Term. The reading test was a standardised IELTS general training reading test, accessible in the Complete IELTS Bands 5 – 6.5 coursebook (Brook-Hart & Jakeman, 2012). Totally 80 students, enrolled in the Department of English Language Teaching at a state university in Turkey, took the reading test. The band scores of the students were cumulated around Bands 4 and 4,5. However, to include more proficient EFL (English as a foreign language) readers as well as less proficient EFL readers, the selection of participants was made paying regard to both homogeneity and heterogeneity. An equal number of participants from different band scores were chosen, which ensured homogeneity because each band score group was equally proficient as approved by the IELTS Reading Test. On the other hand, students from 6 different band scores were included since more proficient readers would be needed to initiate the reciprocal teaching process and less proficient readers were also chosen as participants since reciprocal teaching was already originally developed for students having certain problems in reading (Palincsar & Brown, 1986). Including both less and more skilled comprehenders provided various insights regarding the efficacy of reciprocal teaching.

As shown in Table 1, the numbers of more proficient comprehenders and less proficient comprehenders are equal and the number of participants is 23 in total. All the participants were monolingual speakers of Turkish, their ages ranged from 18 to 22, and 17 of them were female while 6 participants were male. Furthermore, even though they had been learning English for approximately 11 years, all the participants stated that they had not received strategy training previously.

Table 1. Distribution of Participants

IELTS Band Score	N
3	2
3,5	4
4	5
4,5	6
5	4
5,5	2

Data Collection Instruments

Eye Tracking Materials

Three eye tracking sessions were conducted in the current study and three different texts were utilised in these sessions. To decide on which texts would be used during the eye tracking sessions, a pilot implementation was carried out with 20 students before the procedure started. It was aimed to find out the most appropriate, reader-friendly, readable, and the least discomfortable or disturbing texts. 5 texts were decided before the implementation. All five texts were available in the Cambridge University Press Empower B2 Upper Intermediate coursebook (Doff, Thaine, Puchta, Lewis-Jones, & Stranks, et 2015). Using these standardised reading materials ensured that the texts were at the same level. Moreover, the opinion of an expert was taken while choosing the texts and the readability scores of the texts were also calculated.

To determine the texts, a checklist, consisting of 5 short questions, was prepared by the researchers with the guidance of an expert, and the students were supposed to look at the texts and complete the checklist. The texts were selected in consequence of the results obtained through the checklist as well as Flesch Reading Ease scores and Flesch-Kincaid Reading Ages of the texts.

Think-Aloud Protocols

Utilising think-aloud protocols with eye tracking can shed more light on the unclear points because they both attempt to clarify the unknown and vague aspects (Godfroid & Spino, 2015; Kaakinen & Hyonä,

2005; Kacar, 2018). In the present study, retrospective think-aloud protocols were administered. Think-aloud protocols were conducted one by one right after the participants read the text. In coordination with the eye tracking sessions, think-aloud protocols were also conducted three times: in the beginning, after completing the third week and at the end of the study. The participants, without the researchers' interference, thought the reading process over and stated how they had read the text. The protocols were carried out in the participants' mother tongue because the aim was to get insights into the participants' reading process and use of global reading strategies; thus, conducting them in their mother tongue would be more appropriate considering that they might have difficulty in expressing their thoughts in English.

Data Collection Procedure

The present study was carried out for subsequent 10 weeks. To investigate the effects of the strategy training, data were collected three times and in each data collection, participants were supposed to participate in a think-aloud protocol and an eye tracking session. Additionally, the participants were informed about the think-aloud protocols and eye tracking previously. The purpose was to ensure that the participants were aware of the procedure as well as how the data would be collected. They were first informed about the data collection process in think-aloud protocols, namely what think-aloud protocols were, how they would perform the think-aloud protocols and what the challenges of these protocols could be. Certain short articles giving information about the procedure of think-aloud protocols and videos showing how they were conducted were shared with the participants. Furthermore, concerning eye tracking, the eye-tracking device, the appropriate sitting position and how eye tracking works were also told to the participants. However, nearly all the participants participated in an eye-tracking study before; therefore, they had already known the cruxes of eye tracking.

Instructional Process

Considering the reciprocal teaching procedure, a lesson plan (see Appendix C) was prepared by the researchers taking opinions and feedback of the experts. However, in addition to paying special attention to reciprocal teaching procedure, much emphasis was also placed on global reading strategies. More precisely, in fact, in reciprocal teaching, only four main strategies were utilised while comprehending a text, but global reading strategies covered 11 strategies. Even though the four strategies overlapped these 11 strategies, it was needed to plan certain specific activities to enhance participants' use of global reading strategies. Therefore, besides the objectives related to predicting, questioning, clarifying, and summarising, three objectives were determined with the aim of improving use of global reading strategies, too. Accordingly, the activities were designed to fulfil these objectives. The same lesson plan was used during the whole study, yet in every training session, a different text was chosen and utilised. The texts were selected from the following course books: Macmillan Education Effective Reading 4 Upper Intermediate (2010), Cambridge University Press Complete IELTS Bands 5 – 6,5 (2012), Cambridge University Press Objective Proficiency (2013), and Cambridge University Press Prism Level 4 Reading & Writing (2017). To decide on the texts to be used in trainings, the interests, opinions, and feedback of the participants as well as experts' opinions were considered. Additionally, the readability scores of the texts (see Appendix D) were also calculated and the texts were included in the training sessions once positive results had been obtained.

Data Analysis

In the present study, both qualitative and quantitative data analyses were required. For the analysis of qualitative data collected through think-aloud protocols, the coding scheme utilised in Salataci and Akyel's (2002) study was used. However, in accordance with the aims of the present study, certain modifications were made to the coding scheme. The coding scheme of Salataci and Akyel (2002) consists of three main types of reading strategies (i.e., bottom-up, top-down and metacognitive strategies), and 17 subcategories under these three main categories. However, because the current study focused only on the global reading strategies, a modification was needed. Within this necessary modification, the items were not altered.

Instead, the strategies that did not converge were excluded, yet the ones which met one of the global reading strategies were utilised in the analyses of the think-aloud data. To achieve interrater reliability, the think-aloud data were analysed by a different coder, too. The reliability of the findings was calculated by computing Krippendorff's Alpha-Reliability, and the results of the computation revealed high reliability (= .82). Besides, consensus coding was utilised to analyse the content of the think-aloud data. Using consensus coding, it was aimed to ensure a high level of agreement and a robust approach to qualitative analysis (Hays & Singh, 2011, as cited in De Gagne, Hall, Conklin, Yamane, Roth, Chang, & Kim, 2019).

As for the findings related to eye tracking, a one-way ANOVA with repeated measures (RM Anova) was computed for each variable. Furthermore, descriptive statistics were calculated to provide clear pictures of the results.

FINDINGS

Analysis of Eye-Tracking Data

Initial Eye-Tracking Data Analysis

Initially, real-time heat maps including all fixations of 23 participants were generated for each eye tracking experiment (see Appendix B). In a holistic perspective, heat map intensities indicated that participants spent the most time on main paragraphs as expected. Time spent on title areas was observed to have increased over 6 weeks. A similar linear effect was not observed in introductory paragraphs. Image areas in the first and second experiment showed up less intensity when compared to 3rd experiment. For a deeper analysis, mean values for each eye tracking experiment regarding revisits and total fixation duration were given in Table 2 below:

Table 2. Mean Values for Aois Regarding Total Fixation Duration and Revisit Counts in 3 Experiments

	Total Fixation Duration (M/SD) *			Revisits (M/SD)		
Experiment	Titles	Introductory paragraph	Images	Title	Introductory paragraphs	Images
1st Experiment	3/4	19/8	1/1	7/8	21/16	2/3
2nd Experiment	5/5	17/7	1/,74	18/13	21/12	2/3
3rd Experiment	7/3	15/8	6/4	25/12	35/17	17/10

*Note. *Values are in seconds*

Firstly, depending on Table 2, a clear increase of total time and revisits on title area was observed at the end of 6 weeks. High standard deviation values decreased in the 3rd experiment indicating that learners had an overall improvement of their eye movements on titles. Secondly, attention on introductory paragraphs decreased but surprisingly learners employed more revisits. Lastly, learners showed resistance to paying attention to image areas and low total fixation duration and low revisit values persisted until the 3rd experiment. To clarify the impact of the strategy instruction on the learners' attention during text processing regarding titles, introductory paragraphs, and image areas, each AOI was further analysed via RM Anova (see Appendix A). The findings of RM Anova implementations are demonstrated in the following section, and the abovementioned summary findings are explained and discussed in the relevant subsections.

Title Areas

Processing the title of a text is the initial step of reciprocal teaching since titles provide valuable clues about the content of the text. They pose questions about the content and try to internalise their existing knowledge to increase their understanding. To see the effect of the strategy instruction on title processing times, total fixation duration and revisits were analysed.

Since we observed a gradual increase in the total fixation duration and revisits on title areas, RM Anova analyses were carried out to examine the effect of strategy instruction on processing times. Mauchly's test indicated that the assumption of sphericity had been violated at p<.05 level; therefore, degrees of freedom were

corrected using Greenhouse-Geisser estimates of sphericity. The results of RM Anova revealed a statistically significant difference across the three eye tracking sessions in terms of the total fixation duration on the title (F(1.451, 30.479)= 6694; p<.05). Pairwise comparisons with Bonferonni correction indicated that there was a statistically significant difference between the first eye tracking implementation (M=3.34, SD=4.15) and the third eye tracking implementation (M=7.35, SD=2.77) at p< .05 level. However, there were no significant differences between the first eye tracking implementation and the second eye tracking implementation, and between the second eye tracking implementation and the third eye tracking implementation.

Regarding revisits on title areas, we found a statistically significant difference across the three eye tracking experiments (F(2, 42)= 28.560, p<.001). For pairwise comparisons, the findings showed that there were significant differences between the first eye tracking implementation (M=6.77, SD=7.90) and the second eye tracking implementation (M=17.81, SD=13.07), between the first eye tracking implementation (M=6.77, SD=7.90) and the third eye tracking implementation (M=24.54, SD=11.69), and the second eye tracking implementation (M=17.81, SD=13.07) and the third eye tracking implementation (M=24.54, SD=11.69).

It could be concluded from the above-reported findings that at the end of the strategy instruction, there was an apparent improvement in the time spent on the title. The participants looked at the title for a longer time during the last eye tracking implementation, and the results of the fixations indicated that they directed their eyes towards the title gradually more. Additionally, the findings showed that the relook behaviour of the participants improved in a gradual way, which can be interpreted as an encouraging finding considering the steps of reciprocal teaching. In reciprocal teaching (Palincsar & Brown, 1984; Puspita & Nuroh, 2022; Satriani, 2022), learners' attention is focused on the title area in the very beginning, and they are supposed to make predictions about the text based on the title. Guessing the content of the text beforehand activates their schemata, so their background knowledge helps them comprehend the text more easily, effortlessly, and effectively. Considering the importance of the title in the reciprocal teaching procedure, the results can be interpreted as positive outcomes regarding the efficacy of the training in developing L2 readers' use of "previewing text for content", "using context clues", "using text structure", and "using other textual features" strategies. Because the title itself can give clues about the content of a text, it is important for readers to utilise it as an aid while comprehending the text. Moreover, approaching the title as a clue to activate the prior knowledge can be useful for the comprehension process. Thus, once learners have discovered how they can use that clue profitably, they can make the L2 reading process more meaningful and easier (Marboot, 2022; Par, 2020; Rinehart, Gerlach, Wisell, & Welker, 1998).

Introductory Paragraphs

When utilised suitably, introductory paragraphs can serve another critical comprehension aid because it is a brief and to the point summary of the text. Thus, processing time on the introductory paragraph is critical.

Contrary to expectations, while total fixation duration values on the introductory paragraph gradually decreased, revisits increased. For a more detailed analysis, RM Anova was adopted. The results revealed no significant effect of strategy instruction on total fixation duration on introductory paragraphs, (F(2, 42)=2.070, p=.139). For revisits, a statistically significant difference was observed (F(2, 42)=9.606, p<.001). Pairwise comparisons showed that there was a statistically significant difference between the first eye tracking implementation (M=21.47, SD=15.98) and the third eye tracking implementation (M=34.68, SD=17.19), and between the second eye tracking implementation (M=20.90, SD=12.35) and the third eye tracking implementation (M=34.68, SD=17.19), but there was not a statistically significant difference between the first eye tracking implementation and the second eye tracking implementation. In sum, while 6-week strategy instruction did not affect the total time spent on introductory paragraphs, it improved learners' revisit behaviour. This finding might be explained with "the time interval" (Sporer et al., 2009, pp. 279-282) because, after the six-week strategy training, the relook behaviour of the participants improved significantly.

We could not obtain strong empirical evidence suggesting that learners' attention on introductory paragraphs linearly increased over the 6-week period. The only stable finding was that learners' revisiting behaviour on introductory paragraphs developed. It could be concluded from this finding that the participants started reading the text without attaching much importance to the introductory paragraph, but when encountering something problematic or unclear, they preferred coming back to the introductory paragraph, or the

participants did not attach enough importance to introductory paragraphs because they might not distinguish these paragraphs from the main paragraphs and perceive them as the first main paragraph directly connected to the other main paragraphs. Thus, it could be suggested that "further training, which aims at training learners to decide on the most suitable strategy for a specific purpose or a specific area" is needed (Zare & Othman, 2013, p. 192). This is in line with the recommendation of Amini, Zahabi, Amini & Hosseini (2020) by stating that teachers should draw students' attention towards the less utilised yet effective strategies to fill in the gaps in enhancing reading comprehension.

Image Areas

For the eye tracking experiments, a homogenous number of images were placed in the texts, so the participants might find clues about the content since the images can be regarded as the most apparent context clues given in a passage (O'Neil, 2011).

We could not observe a linear increase regarding both total fixation duration and revisits on image areas. The first and second eye tracking experiments revealed similar mean values for both measures. However, total time and revisits spiked in the 3rd experiment made at the end of the instructional period. For a more detailed analysis, RM Anova was implemented. Mauchly's test indicated that the assumption of sphericity had been violated at $p<.05$ level; therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity. Regarding total fixation duration, a statistically significant difference was found across the time points of eye tracking implementations ($F(1.148, 24.109)=48.150$, $p<.001$). Pairwise comparison results indicated a significant difference between the first eye tracking experiment (M=1.07, SD=1.17) and the third eye tracking implementation (M=6.49, SD=3.61), and between the second eye tracking implementation (M=1.10, SD=.74) and the third eye tracking implementation (M=6.49, SD=3.61). No statistically significant difference was observed between the first eye tracking implementation and the second eye tracking implementation as expected.

Analysis on revisits yielded similar results. The findings showed a statistically significant difference ($F(1.095, 23.000)=56.781$, $p<.001$) across three eye tracking experiments. Pairwise comparisons with Bonferroni correction revealed a statistically significant difference between the first eye tracking implementation (M=1.95, SD=3.03) and the third eye tracking implementation (M=16.81, SD=9.57), and between the second eye tracking implementation (M=1.95, SD=2.57) and the third eye tracking implementation (M=16.81, SD=9.57), yet there was not a statistically significant difference between the first eye tracking implementation and the second eye tracking implementation.

These findings might approve the effectiveness of the strategy training in improving the participants' use of the "using context clues" strategy, which indeed means "using pictures, tables, and figures" as contextual aids (Bishop, Reyes, & Pflaum, 2006; Mokhtari & Reichard, 2002; Ozturk, 2018). Even though reciprocal teaching did not include a specific step that directed learners to utilise such aids to increase their understanding, the sessions carried out in the present study were planned by considering the global reading strategies as well. More precisely, objectives were added and accordingly, specific activities were included in the lesson plan. Therefore, by considering the instruction and the additions, it could be concluded from the findings that the strategy training had facilitative effects on the use of the 'using context clues' strategy.

Analysis of Think-Aloud Protocols

The aim of conducting think-aloud protocols was to shed more light on the participants' use of global reading strategies since it was clear that each global reading strategy could not be examined only through eye tracking. Thus, to find out what remained unknown in the eye tracking sessions, think-aloud protocols were also carried out. In Table 3, the findings related to three think-aloud protocols were displayed, and it was evident that frequencies of the strategies varied though some of them were reported repeatedly in all three think-aloud protocols.

Table 3. Frequencies of the Strategies Found in the Analysis of Think-Aloud Protocols

Strategy	1st Think-aloud protocol (f)	2nd Think-aloud protocol (f)	3rd Think-aloud protocol (f)
Prediction	4	10	6
Associations with prior knowledge	4	-	-
Questioning, assessing, and commenting on the information in the text	3	-	-
Skimming/scanning reading material for a general understanding	4	15	19
Reference to the antecedent information	1	-	-
Confirmation (or modification) of prediction	-	4	1
Personal comments	-	1	1

Five strategies were found to be used by a total of 23 participants in the first think-aloud protocol, before the strategy training started. The findings revealed that the "skimming" strategy was used by four of the participants. Even though three of them stated no reasoning behind their skimming behaviour, one of the participants explained why s/he skimmed the whole text as demonstrated in the following extract:

Firstly, I only skimmed as a global way of synthesising. (Participant 3)

On the other hand, it was seen that four participants employed the "predicting" strategy, and the "questioning" strategy was used by three participants. The findings showed that they used the title, pictures or questions related to the text while posing questions and making predictions about the text. Considering the four strategies of reciprocal teaching, these findings could be interpreted as a welcoming start for the present study. Nonetheless, seeing that the big majority of the participants utilised neither of the strategies might support the idea that training might provide them with particular reading strategies. Finally, concerning establishing associations with prior knowledge or prior information, the results indicated that four participants drew connections between what they had already known and what the text included, whereas re-thinking over a certain part of the text was performed by only one participant. The following extract shows how the participant linked different points given in the text:

I used the keywords there; I made connections with those words. (Participant 12)

Although the codes found in the first and second think-aloud protocols' analyses were basically the same, certain strategies had been employed while reading the first text but were not used in the second implementation or vice versa. In comparison with the first think-aloud protocol's findings, it could be said that the second think-aloud protocol offered less variety regarding the reading strategies employed by the participants because only four codes emerged in the analysis. On the other hand, the results showed that there was an improvement in the use of the "skimming" strategy (f=15) and the "predicting" strategy (f=10). Nine of the participants who made predictions on the content of the text stated that they used the title while predicting what the text could be about. Because the very first step of reciprocal teaching was looking at the title and making predictions about the content, this finding was very encouraging in terms of the efficacy of reciprocal teaching in facilitating L2 readers' metacognitive awareness of using "predicting" as a reading strategy. The results also showed that four participants addressed this strategy as a step to confirm or modify their predictions. Participant 8 explains how s/he performed this confirmation as follows:

Then, the photos on the right directed my attention. When I did not realise that there was not a person describing a different emotion from the others, I thought that it was completely about optimism. (Participant 8)

Hand in hand with the predicting strategy, the skimming strategy was used by the participants to foster their understanding and note characteristics of the text. Besides, the findings revealed that the participants utilised the images as well while skimming, especially to find clues about the text. As it was mentioned in the previous subheading, the images might serve as useful contextual clues, and if L2 readers knew how to use these clues effectively, they could be better L2 comprehenders and the amount of time spent understanding the problematic points in a given text could decrease. The following extract displays how participant 7 used these context clues in making connections between the title and the images:

> *Firstly, before reading the text, I looked at the title, then looked at the pictures next to the text, I tried to associate the pictures with the title.* (Participant 7)

The above-given extract clarified that the participants did not use the strategies separately at all and preferred combining the strategies from time to time. To exemplify, Participant 7 employed "using context clues", "previewing text for content" and "skimming to note text characteristics" at the same time. In this respect, it could be said that the findings of the third think-aloud protocol bore a resemblance to those of the second. To be more precise, it was seen that the participants employed certain strategies synchronously and relatedly while reading the third passage. Moreover, similar to the second think-aloud protocol's findings, four codes were found in the analysis of the third think-aloud protocol.

The frequency of the skimming strategy was found to be 19, which was higher than those of the first and the second think-aloud protocols; thus, it could be concluded that the strategy training affected the use of the skimming strategy positively. On the other hand, whereas it was higher than that of the first think-aloud protocol, the frequency of the predicting strategy was found to be 6. However, compared to the second, the participants utilised the predicting strategy less often while reading the third text. Considering that both the skimming and predicting strategies served the same purpose, this finding could be interpreted as a promising outcome for the future use of reciprocal teaching in the L2 environments. More precisely, both strategies helped L2 readers to sustain their general understanding before they start to read. Therefore, the increase in the total frequency of these two strategies might be quite encouraging for the efficacy of reciprocal teaching in facilitating the use of global reading strategies. Furthermore, the findings revealed that a personal comment was expressed by two participants, in the second and third think-aloud protocols. Fortunately, both comments confirmed that the texts were suitable to the participants' interests since they both stated that they liked the topic, and the texts directed their attention.

In conclusion, it might be said that the strategy training, conducted through reciprocal teaching, was beneficial to improve the use of global reading strategies, which was also suggested in the above-mentioned research studies (Alrabah & Wu, 2019; Alshammari, 2022; Deliany, 2020; Salataci & Akyel, 2002; Sporer et al., 2009). When compared the total frequency of the codes found in the first think-aloud protocol to that of the third one, it could be seen that there was an increase in the participants' use of skimming and predicting strategies.

CONCLUSION

Janzen (2002) starts her book chapter exemplifying two types of readers that indeed clarify why strategic reading has become more of an issue. In her well-describing examples, the focus is on adopting different approaches while preparing for an upcoming reading exam and reading a given text. From this point forth, thanks to the inspiration gained because of Janzen (2002), a further exemplification will be put forward: April is a learner of English, who is aware of her responsibilities and spends hours completing all her duties. Joy is also as hardworking as April. She likes expanding her knowledge getting the benefit of what is taught to her. When they are told that they will take a reading exam, both begin to study immediately. April takes her favourite books and starts reading various materials looking up every single unknown word. She thinks that she will be able to get ready if she memorises several words. Actually, she is not that wrong. On the other hand, Joy prefers reading in a bit different way. In her opinion, looking up all the unknown words can be time-consuming. Thus, she tries to make use of what the context gives to her. Her favourite helpers are sometimes the pictures or another word next to the unknown word. She also thinks that the way one starts reading is very crucial. She hence prefers previewing the text to see if she is familiar with the content. Bearing the findings of the current research study as well as the abovementioned

studies discussed in detail previously (Alrabah & Wu, 2019; Alshammari, 2022; Deliany, 2020; Salataci & Akyel, 2002; Sporer et al., 2009), the result of the exam is obvious.

In the present study, the underlying purpose was to provide the participants with opportunities through which they could become more strategic readers and better comprehenders. Utilising reciprocal teaching as the way of instruction, a six-week strategy training was carried out to facilitate Turkish EFL learners' use of global reading strategies. 23 freshmen, enrolled in the English Language Teaching Department of a state university in Turkey, participated in the study, and the data were collected both quantitatively and qualitatively. In a word, how reciprocal teaching would affect the use of global reading strategies was examined through eye tracking and think-aloud protocols. The whole procedure lasted successive ten weeks, but before the study started, a pilot test was implemented to decide on the texts to be used during the eye tracking sessions. What's more, a former examination was held to determine the participants. The findings of eye tracking and think-aloud protocols revealed that the participants employed these strategies more frequently after they took the instruction. Among the three eye tracking implementations, within the three areas of interest statistically significant differences were found mostly between the first and the third eye tracking implementation. The think-aloud protocols' results confirmed the betterment of the participants' strategy use. Particularly considering what the analyses revealed regarding the use of "previewing text for content" and "skimming to note text characteristics" strategies along with prediction, it might be suggested that reciprocal teaching is a fruitful way of instruction that can be used to facilitate the use of global reading strategies.

Implications for Teaching

The present study was grounded in three concepts: reciprocal teaching, global reading strategies and eye tracking. Chosen as the instructional method within this study, reciprocal teaching was first formed by Palincsar and Brown 38 years ago, in 1984. When they put forward reciprocal teaching, they aimed at finding solutions for L1 readers' problems, so originally, this method was developed for less proficient L1 readers. They proposed "four strategies (i.e., summarising (self-review), questioning, clarifying, and predicting)" to help learners both monitor and foster their comprehension (Palincsar & Brown, 1984, pp. 118-121). Alternatively, Cotterall (1990, 1993) suggested that reciprocal teaching be used in ESL contexts as well. She directed the attention to the factors to be considered in ESL environments and suggested reciprocal teaching as a training method by combining metacognitive consciousness-raising and strategy training (Cotterall, 1993). On the other hand, Song (1998) was the researcher who first gave the idea of utilising reciprocal teaching in EFL environments. Like Palincsar and Brown, Song (1998) also put forward this method into consideration for less proficient readers. However, because of the four global strategies emphasised in reciprocal teaching, it could be used with more skilled L2 learners as they enabled them to foster their general understanding as well as draw more logical conclusions (Song, 1998). It was chosen as the way of instruction in the Turkish EFL context as well, and its positive impact on Turkish EFL learners' reading comprehension in L2 (Dokur, 2017; Ozturk, 2018; Pilten, 2016) along with its efficacy in fostering L1 reading comprehension (Salataci & Akyel, 2002) were confirmed within various studies. Hence, it can be suggested that reciprocal teaching be utilised in the Turkish EFL environment as well. The "predicting" strategy of reciprocal teaching enables learners to develop a general understanding and activates their background knowledge about the given topic while the "summarising" strategy facilitates their comprehension by guiding them to verbalise what they have understood in their own words. By doing so, they can draw more personal conclusions about the given texts and internalise what is delivered via the texts more effectively. On the other hand, the other two strategies, namely questioning and clarifying, provide learners with opportunities in which they can focus on their weaknesses more easily. By posing questions on the unknown or incomprehensible words and structures, learners are required to think their existing knowledge over. Moreover, accordingly, by clarifying these problematic components of the texts, they can find immediate answers to their questions. Additionally, in reciprocal teaching, the teacher shares the leading role with learners by letting them be leaders or facilitators throughout the process. In this way, learners take the responsibility of their learning and contribute to their learning process actively. Therefore, using the original sequence of reciprocal teaching (Palincsar & Brown, 1984; Puspita & Nuroh, 2022) or integrating one of the four strategies into a step of the lesson might be very useful for the improvement of learners' reading comprehension skills and strategy awareness as well as for making them better thinkers.

Global reading strategies, the second fundamental concept of the present study, were found to be employed gradually more frequently by the participants. Thus, it could be suggested that training programs, specifically designed to improve strategy use, might be to the advantage of EFL learners. Global reading strategies comprise 13 reading strategies, ranging from skimming to note text characteristics to using context clues, text structure or textual features. Throughout the training lessons of the current study, specific steps and activities were included so as to enable the participants to employ these strategies both implicitly and explicitly. Apparently, directing learners' attention to the strategies might provide valuable benefits for them. Therefore, English language teachers should plan and integrate certain activities into their courses for the betterment of learners' use of these strategies. To illustrate, as a warm-up activity of a reading lesson, the teacher can show some photos or videos related to the text to be read and discussed in the lesson and ask certain guiding questions to make predictions about the content of the text. While getting the answers of learners, he or she can form a mind-map on the board in order to make what has been put forward clear, visible and more comprehensible (Budd, 2004). Through such a warm-up activity, the use of predicting strategy, which is also one of the 13 global reading strategies, can be facilitated. After that, the teacher may guide learners to skim the whole text to find some keywords about the text and hold a whole-class discussion to produce ideas on the text. Associating the previously stated suggestions with the newly emerged ones, learners can be required to use context clues (i.e., images, figures or tables, or text structure) while skimming the text and identifying their ideas, which might accordingly foster learners' global understanding and make their reading process easier.

And last but not least, eye tracking was determined as the third fundamental concept of the present research study. Although this concept may not be utilised in classroom settings, namely while teaching one of the four language skills or other areas of the language, it can be included in research studies, which have more teaching-based purposes, as a recent data collection tool. Considering that eye tracking makes what learners perform in the process of L2 learning apparent, it can be suggested that it may be used to examine the efficacy of different teaching methods or techniques (Hyönä, Lorch, & Rinck, 2003). However, it should be noted that the research triangulation needs to be well-planned since eye tracking, alone, might not be efficient enough to find out the different aspects of what is examined.

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APPENDIX A

AOIs

1st Experiment

2nd Experiment

3rd Experiment

APPENDIX B

Real-Time Heat Maps

1st Experiment

2nd Experiment

3rd Experiment
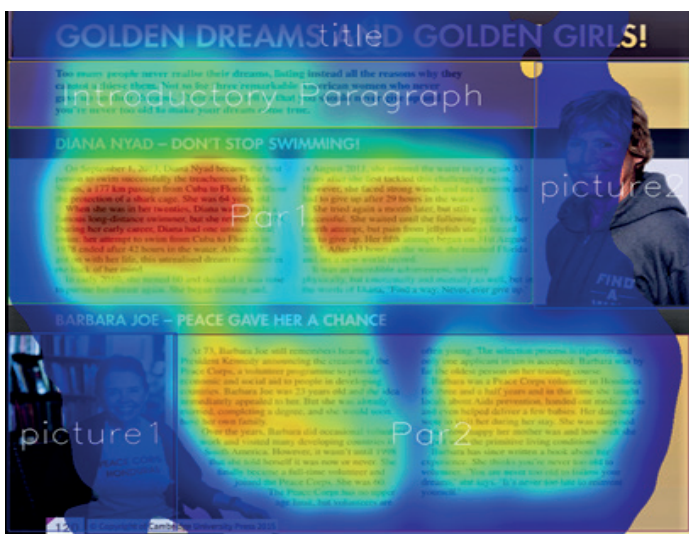
Lesson Plan Followed throughout the Trainings

Students: 23 first grade college students who are enrolled in the Department of ELT
Duration: 50 minutes
Aim: By the end of the lesson, the students will be able to comprehend a reading text.

Objectives: By the end of the lesson, the students will be able to

1. state what their purpose of reading the text is.
2. skim the text to note its characteristics like length and organisation.
3. skim the paragraphs to make predictions on the content of the paragraphs.
4. scan the text to comprehend contextual clues, tables, figures, pictures and typographical aids like bold face and italics.
5. scan the text to pose questions related to the text content.
6. interpret the text for clarification of incomprehensible points in the text.
7. summarise the text to draw conclusions about the content of the text and the paragraphs.

Procedure:

Pre – Reading

1. The teacher gives the reading text (See Appendix A) to each student.
2. The teacher and students solely look at the title of the text and make predictions on the content of the text. At this stage, the teacher encourages students to remember what they know about the possible content of the text, that is, students' background knowledge is tried to be activated.
3. The teacher asks what their purpose of reading can be and guides them to determine a purpose and state it.
4. The teacher asks students to skim the whole text in order to note its characteristics like length and organisation.

While – Reading First Phase

1. Students read the first paragraph of the text silently.
2. The teacher asks students to scan the text in order to comprehend context clues and typographical aids.
3. The teacher models how to ask questions about the paragraph and how to clarify blurred points. While posing questions and clarifying unclear points, the teacher, acting as a model, shows how to use contextual clues, tables, figures, pictures and typographical aids like bold face and italics in order to both increase understanding and identify key information.
4. The teacher models how to summarise the paragraph and how to predict the content of the following paragraph respectively. The teacher can repeat modelling at the following stages because it may take time to make students confident about taking roles, so the teacher should be patient and pay regard to wait time.
5. A volunteer student is asked to be the leader who will guide the same procedure: firstly, the leader lets students read the paragraph silently and asks to scan the text to comprehend context clues and typographical aids.
6. The leader asks a leading question about incomprehensible points in the paragraph and encourages students to ask more questions.
7. The leader seeks or provides clarification for unclear points (e.g. unknown words, problematic grammar structures that inconvenience students' understanding).
8. The leader states the main idea of the paragraph and summarises the content of the paragraph.
9. The leader makes predictions about the content of the following paragraph and asks a volunteer student to be the next leader. (This process continues in this way till each paragraph is comprehended.)

While – Reading	**Second Phase**	1. The teacher gives the worksheet (see Appendix B), including comprehension questions related to the text.
		2. The teacher divides the class into groups of three, introduces the first comprehension activity and tells students that they will complete the table with short answers.
		3. As a group of three, students complete the table with short answers.
		4. The teacher, acting as a guide, let students check the answers all together. (The teacher can choose a volunteer who will guide the activity – that is to say, after he/she starts, a volunteer may decide on the person who will share his or her answer with the class.)
		5. After the answers of the first comprehension activity are checked, the teacher introduces the second comprehension activity, which includes 4 multiple-choice questions.
		6. Students answers the multiple-choice questions of the second comprehension activity.
		7. The answers of the second comprehension activity are checked and then the teacher introduces the third comprehension activity, consisting of more detailed and specific questions related to the text.
		8. Students answers the questions of the third comprehension activity.
		9. The answers of the last activity are checked.
	Post – Reading	1. The teacher addresses the following two questions and encourage students to discuss these questions with a partner:
		2. Do you agree with the punishment the author received when he was eight years old? What would your parents do in a similar situation? What would you do if you were the parent?
		3. When the author was caught stealing at the supermarket, what did his friend Andy do? What do you think about Andy's action? What would you have done if you were Andy?
	Back-Up Activity: A quiz prepared online through https://quizlet.com/tr is used as the back-up activity. Students work in pairs and answers the questions.	

APPENDIX D

Readability Scores of the Texts Utilised During the Trainings

Text	Flesch Reading Ease Score	Flesch-Kincaid Reading Age
Text 1	79,3	7,2
Text 2	75,4	7,2
Text 3	73,3	7,9
Text 4	76,5	8,2
Text 5	69,3	7,1
Text 6	78,9	8,3
Text 7	74,4	7,8
Text 8	66,6	7,1
Text 9	69,9	7,2
Text 10	73,2	7,8
Text 11	70,2	7,9
Text 12	71,6	8,1

IMPACT OF SYNCHRONOUS ONLINE LEARNING ENVIRONMENT ON STUDENTS' COGNITIVE ENGAGEMENT AND LEARNING OUTCOMES

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ABSTRACT

Although roles of teaching presence have often been neglected in online learning environments, recent research has acknowledged its burgeoning importance. Synchronous online learning mode in which the teaching and learning process occurs in concurrent real-time helps blur the physical boundary hindrance of online learning for students. However, being present in classes, even in brick-and-mortar classes or virtual classes, does not ensure students' learning occurrence. The purpose of this study was to investigate the effects of synchronous online learning environments (SOLE) on students' cognitive engagement, satisfaction, and academic achievement as well. Partial Least Square Structural Equation Modeling (PLS-SEM) was utilized to examine the issue under investigation. The results from a questionnaire survey from 186 participants indicated that pedagogical instructions had direct positive medium effects on both deep and shallow cognitive engagements; deep cognitive engagement had a direct positive impact on academic achievement while shallow cognitive engagement did not have any impact on academic achievement and satisfaction. Interestingly, technical support had a direct positive impact on both direct impacts on academic achievements and satisfaction. Implications for the teaching and learning in a synchronous online modality and limitations of the study were also discussed.

Keywords: Synchronous online learning, cognitive engagement, satisfaction, academic achievements, higher education, Vietnam.

INTRODUCTION

Although online learning has become universally widespread, especially in higher education (Andrew, Wallace, & Sambell, 2021), and was forecast to become mainstream by 2025 (Palvia et al, 2018), synchronous online learning is relatively new in this teaching and learning environment (Phelps & Vlachopoulos 2019). Online learning environments can be categorized into two types: asynchronous and synchronous (real-time) delivery (Chen, Ko, Kinshuk, & Lin, 2005). While a multitude of research on asynchronous learning modes has been conducted in higher education in the literature, synchronous interactions have been increasingly researched thanks to an upsurge in technology in the Fourth Industrial Revolution (Watts, 2016). The use of synchronous web-conferencing interactions was found to increase teaching and social presence (Clark, Strudler, & Grove 2015). This finding is especially crucial since it helps tackle the in-nature drawbacks of online learning mode, which are students' low level of engagement (Kim, Lee, Leite, & Huggins-Manley, 2020), feelings of isolation (Clark, Strudler, & Grove, 2015), or sense of belonging (Cunningham & Cunningham, 2014).

Learning environments had positive effects on students' learning satisfaction (Wu, Tennyson, & Hsia, 2010) in blended learning modality and online learning (Zou et al., 2021). Students admitted that the synchronous online learning section helped them to interact with instructors timely, having timely feedback,

more interesting lessons thanks to instructors' use of various modern technology applications (Zou et al., 2021). Hubbard (2019) posited that learning environments with technology-assisted activities facilitate students' learning process in terms of knowledge access and/or skills retention, and so improvement of learning effectiveness.

Learning engagement also plays a crucial role in predicting students' academic achievement (Chase, Hilliard, John Geldhof, Warren , & Lerner, 2014; van Rooij, Jansen, & van de Grift, 2017). In particular, a study by Chase and his cohort (Chase, Hilliard, John Geldhof, Warren , & Lerner, 2014) confirmed a significant correlation between behavioral engagement and students' academic results, while research work by van Rooiji and his team (2017) identified a strong association between cognitive engagement and academic outcomes. Synchronous learning environments were also found to have varying impacts on students' cognitive engagement. Teaching presence or pedagogical affordance was found to have a direct positive impact on cognitive engagement (Lee & Koszalka, 2016; Shi, Tong, & Long, 2021; Zhang, Lin, Zhan, & Ren, 2016), while social and technological presence was proved not to have effects on students' cognitive engagement (Shi, Tong, & Long, 2021).

Previous studies have shown varying impacts on students' engagement in online learning modes, such as motivation (e.g., Shi, Tong, & Long, 2021; Xie, Heddy, & Greene, 2019; Zhou, Ntoumanis, & Thøgersen-Ntoumani, 2019), pedagogical affordance (Lee & Koszalka, 2016; Shi, Tong, & Long, 2021; Zhang, Lin, Zhan, & Ren, 2016), and instructors and students' technological & pedagogical skills (Zhang, Lin, Zhan, & Ren, 2016; Elshami et al., 2022). However, this correlation is still equivocal.

In the same vein, students' engagement was found to be an indicator of their academic achievements (Colling, Wollschläger, Keller, Preckel, & Fischbach, 2022; van Rooij, Jansen, & van de Grift, 2017; Elshami et al., 2022), and students' satisfaction (Gray & Diloreto, 2016; Murillo-Zamorano, Lopez Sanchez, & Godoy-Caballero, 2019).

Albeit an increase in synchronous online learning (Palvia et al., 2018; Bedenlier et al., 2021; Elshami et al., 2022; Ji, Park, & Shin, 2022; Meskill & Anthony, 2014; Torun, 2013; Suliman, Ta'an, Abdalrhim, Tawalbeh, & Aljezawi, 2022; Wolverton, 2018; Yang, Li, Liu, & Tan, 2021), there is a dearth of research investigating the effects of synchronous online learning environments on students' cognitive engagement, their satisfactions and academic achievements with empirical research method in higher education contexts. This study caters to this need. The research questions are formulated as follows:

RQ1: What are the relationships among synchronous online learning environments, students' cognitive engagement, satisfaction, and academic achievements?

RQ2: Do synchronous online learning environments have an influence on students' cognitive engagement?

RQ3: Do synchronous online learning environments have an influence on students' satisfaction and their academic achievements?

RQ4: Do students' cognitive engagement have an influence on students' satisfaction and their academic achievements?

LITERATURE REVIEW

Synchronous Online Learning Environments (SOLE) and Cognitive Engagement

Synchronous online learning environments are defined as a form of learning in which participants are allowed to interact with each other and instructors in real-time thanks to the use of synchronous online learning tools such as chat rooms or videoconferencing (Ji, Park, & Shin, 2022). This learning modality is believed to become "a learning paradigm shift in the post-corona era" (Ji, Park, & Shin, 2022, p.1). However, a favorable learning environment should feature pedagogical, social, and technical elements (Kirschner et al., 2004; Wang, 2008). In this paper, pedagogical elements refer to the use of sound teaching methods to boost the effectiveness of the teaching and learning process (Tang & Hew 2017) in synchronous online learning environments. It was measured by subscales of Teaching presence. Social affordance refers to the perceptions of how synchronous online learning environments can facilitate students' social presence which

refs to students' sense of belonging and their ability to engage in social interactions (Kirschner et al., 2004). It was measured by subscales of social presence. Technological affordance refers to the features of synchronous online learning environments that can facilitate students in completing their tasks (Kirschner et al., 2004). However synchronous online learning tools can assist in removing physical distance barriers, they cannot replace in-class face-to-face interactions (Carbajal-Carrera, 2021; Andel et al., 2020). This can be presumably explained that being present in classes, even in brick-and-mortar classes or virtual classes, does not ensure students' learning occurrence.

Although student's engagement is a crucial indicator of student's learning outcomes in higher education, especially in online learning mode (Redmond, et al., 2018), there is a paucity of empirical evidence directly addressing the impact of pedagogical affordance on student engagement in online learning (Halverson, Graham, Spring, Drysdale, & Henrie, 2014; Yang, Li, Liu, & Tan, 2016). This is, theoretically, attributed to the elusiveness of the term "engagement" which is originated in students' different characteristics (Wolverton, Guidry Hollier, & Lanier 2020).

When studying online, students are expected to get involved in five categories of engagement, namely social, cognitive, behavioral, collaborative, and emotional engagement (Redmond, et al., 2018). It is beyond the scope of this study to examine the effects of synchronous online learning modality on these five dimensions of engagement, and so cognitive engagement was the focus of this research.

Cognitive engagement has numerous variances in its definition. It can be understood as the involvement of leaners in metacognition, active learning, critical thinking, and deep learning (Redmond, Abawi , Brown , Henderson, & Heffernan, 2018), or the students' effort in tackling with new materials, complicated ideas, and mastering new skills (Cooper, 2014; Fredricks, Blumenfeld, & Paris, 2004; Ji, Park, & Shin, 2022; Shi, Tong, & Long, 2021). As can be seen that it is dependent on what aspect of students' involvement in their learning process that the term is aimed to cover, but it entails cognitive process as a common feature. In this study, cognitive engagement comprises of two types: deep and surface cognitive engagement by (Greene, 2015; Xie, Heddy, & Greene, 2019). Surface or shallow cognitive engagement involves using memorization strategies such as memorizing, rehearsing, or rereading techniques (Xie, Heddy, & Greene, 2019); while deep cognitive engagement involves students' ability to utilize a high level of psychological investment, such as critical thinking, comparison, justification, and integration of ideas or information (Redmond, Abawi , Brown , Henderson, & Heffernan, 2018).

Previous studies showed that pedagogical instructions had a direct positive impact on cognitive engagement (Shi, Tong, & Long, 2021; Zhong, et al., 2022; Wang and Stein, 2021) while social presence and technical support were found not to have any correlation with cognitive engagement BL synchronous learning environments (Shi, Tong, & Long, 2021). However, other studies revealed that social interactions played an important role in enhancing students' satisfaction and learning engagement in BL asynchronous and synchronous courses (Cheng & Chau, 2016; Zhong, Wang, Lv, Xu, & Zhang, 2022), students' outcomes and satisfaction (Richardson, Maeda, Lv, & Caskurlu, 2017; Andel et al., 2020). Wang's (2022) study found a significant positive correlation between technological support and students' cognitive engagement. In a similar vein, a very recent study by Ji and her cohorts inferred that technical support would greatly affect students' cognitive engagement and satisfaction in a synchronous online English language classes (Ji, Park & Shin, 2022).

Relationship among SOLE, Satisfaction, and Academic Achievements

Student satisfaction plays an important role in measuring students' learning performance or non-academic outcomes, and can be measured by self-report questionnaires (Bowyer & Chambers 2017). Identifying student satisfaction is essential since it helps educators to assist students with their learning progression (Anthonysamy, Koo, & Hew, 2020) and academic achievement (Gopal, Singh, & Aggarwal, 2021) and retention (Dhaqane & Afrah 2016).

A study by Ji and her teammates (2022) surveying 82 Korean undergraduates using least squares regression analysis indicated that the more students were involved in synchronous online learning environment, the higher levels of satisfaction they had. This result was congruent with studies indicating that social presence

has a positive correlation with students' satisfaction in online learning environments (Andel et al., 2020; Zhong, Wang, Lv, Xu, & Zhang, 2022). Similarly, Watts (2016) found that synchronous learning facilitated students' social communication with peers and instructors, and avoided frustrations in online learning. In addition, social presence was closely correlated with students' academic achievements (Al-dheleai, Tasir, Al-Rahmi, Al-Sharafi, & Mydin, 2020). What is more, technological support was found correlated with student satisfaction in online learning (Almusharraf & Khahro, 2020; Aikina & Bolsunovskaya, 2020; Almusharraf & Khahro, 2020). Interestingly, studies also indicated that when students could see face-to-face online with their instructors, their satisfaction increased (Yoo & Jung 2022). Teaching presence was also found to have a positive impact on students' satisfaction (Turk, Heddy, & Danielson, 2022).

Review research on the impact of synchronous and asynchronous learning on students' grades remained inconclusive (Watts, 2016). A very recent study on the effects of synchronous online classes on students' outcomes found that undergraduate nursing students undertaking the program significantly increased their knowledge and abilities to make decisions, but students who received asynchronous online classes also achieved a similar result nonetheless (Suliman, Ta'an, Abdalrhim, Tawalbeh, & Aljezawi, 2022). This result was in line with previous studies on the subject of ethical and legal-decision making (e.g., Bijani, Tehranineshat, & Torabizadeh, 2019; Sari, Baysal, Celik, & Eser, 2018; Yeom, Ahn, & Kim, 2018).

Literature review also indicated a correlation between learning environments and students' academic achievements. A learning environment in which students were overloaded with workload or the use of multiple choices for testing would advocate students to employ surface approach which was testified to yield low academic achievements (Feeley & Biggerstaff, 2015; Ohrstedt & Lindfors, 2019; Takase & Yoshida, 2021; Toraman, Ozdemir, Aytug Kosan, & Orakci, 2020).

Cognitive Engagement, Students' Satisfaction, and Academic Achievements

There is growing evidence showing that student engagement has a positive correlation with satisfaction (Chan, Lin, Chau, Takemura, & Fung, 2021; Croxton, 2014; Ji, Park, & Shin, 2022; Martin & Bolliger, 2018; Meyer, 2014). What is more, students' satisfaction can be boosted by enhancing their engagement (Wolverton, Guidry Hollier, & Lanier, 2020). However, this finding was still equivocal since students were found to be dissatisfied with online collaborative activities due to technological-related skills (Elshami et al., 2022; Garratt-Reed, Roberts, & Heritage, 2016).

It can be seen that students' satisfaction with online learning can be influenced by internal factors (i.e., students' active involvement in the learning process, or knowledge of technical skills), and external factors, such as learning environment or technological affordance.

Previous studies also revealed inconsistent effects of deep learning on students' academic achievements. For example, recent evidence has shown a positive impact of deep learning strategies and students' academic performance (e.g., Bolliger& Halupa, 2018; Liu S., Liu, S., Liu, Z., Peng, & Yang, 2022); meanwhile other studies did not find such a relationship (Campbell & Cabrera, 2014; Ohrstedt & Lindfors, 2019). However, Gomez-Rey, Barbera, and Fernandez-Navarro (2016) suggested more metacognitive practices should be done in higher education institutions for students to improve the acquired knowledge, and hence an increase in their satisfaction.

Research Model and Hypotheses

Prior studies revealed significant relationships among synchronous online learning environments and students. The purpose of this study was to investigate the relationships among a BSLE (Pedagogical, social, and technical affordance), learning motivation, and cognitive engagement. The research model and hypotheses are illustrated in Figure 1.

H1: Pedagogical instructions have positive effects on students' cognitive engagement, satisfaction, and academic achievements in synchronous online environments.

H2: Social interactions have positive effects on students' cognitive engagement, satisfaction, and academic achievements in synchronous online environments.

H3: Technological support has positive effects on students' cognitive engagement, satisfaction, and academic achievements in synchronous online environments.

H4: Students' cognitive engagements have positive effects on their satisfaction and academic achievements in synchronous online environments.
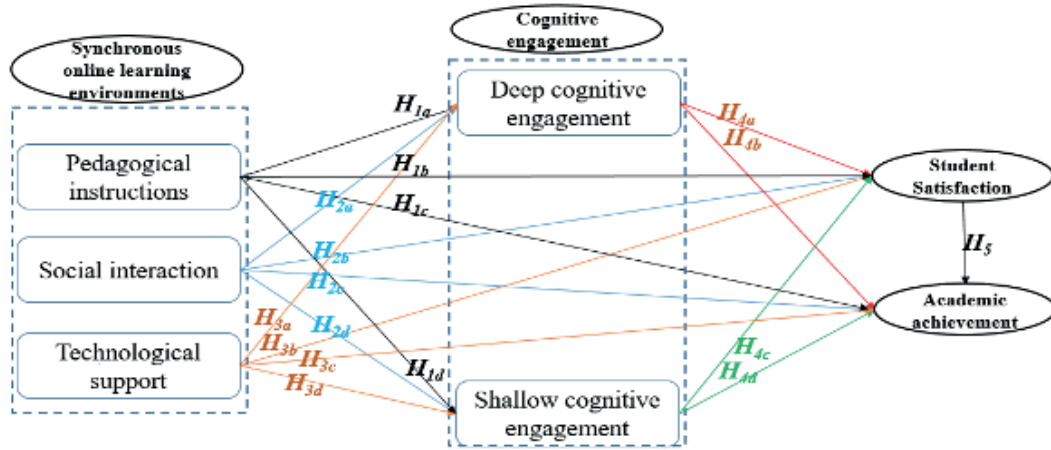
Figure 1. The proposed research model

METHOD

Participants

The current study aimed to obtain the confidence level of 95% and the margin of error with 5%. The participants of the study were 224, recruited from a university in Mekong Delta from March 26 to April 18, 2022. The participants, first-year students, aging from 18-20, were those who have studied in synchronous online EFL classes in a span of Covid-19 as required by the university. A link to the Questionnaires and a Consent Form were sent to these participants.

Of 244 responses were obtained, 183 were qualified for data analysis. According to Kock and Hadaya (2018), the minimum sample size (n_{min}) with a significance level of 5% and a minimum path coefficient (p_{min}) of 0.2 within the minimum magnitude in the PLS-SEM math model is calculated by the following equation: $n_{min}>((2.846/p_{min})^2) \rightarrow n_{min}>((2/486/0.2)^2) = 154.505$, so the minimum sample size is 155. Hence, further adata analysis of the study is ensured. Table 1 below provides detailed demographics of participants.

Table 1. Participant demographics

		N	Percentage (%)
Gender	Male	85	46.5
	Female	98	53.5
Age	18-20	103	28.9
Majors	Business	43	23.4
	IT	80	43.7
	English	60	32.8

Research Instruments

The 46-item modified questionnaires were adapted from previous studies. In particular, the items related to pedagogical affordance and social presence were adapted from Arbaugh, et al. (2008) technological support items were adapted from Davis (1989); those relevant to students' cognitive engagement were adapted from Miller and his cohorts (1996)performance goals, obtaining future consequences, pleasing the teacher, and

pleasing the family; students' satisfaction and academic achievement were adapted from Ejubovic and Puska (2019). Five-point Likert scale was used, starting from Strongly disagree to Strongly agree, to investigate the participants' perspectives on the issue under investigation.

Data Collection and Analysis

Google Forms was employed to collect data from the participants. Prior to the actual data collection phase, the questionnaire was administered to forty-eight students of the researcher's class for the purpose of piloting phase. The Cronbach's Alpha of the variables were ranged from 0.85 – 0.95, indicating that the instrument was reliable for further data collection and analysis.

Smart-PLS 3.0 was utilized to measure the reliability of the questionnaire in the actual data collection phase, the correlation between observation variables and latent variables through a reflective measurement mode. The use of the Partial least squares-based structural equation modelling (PLS-SEM) is in the field of information systems, and has been proved to be helpful in many other fields where multivariate statistical methods are employed. Furthermore, if the research purpose is to explain the relationships between exogenous and endogenous constructs, and the sample size is small (n<100), PLS-SEM would be definitely appropriate (Hair et al., 2021).

ANALYSIS AND RESULTS

Instrument Reliability and Validity

Table 2. Measurement Model Parameter Estimation

Dimensions	Items	Factor loadings	Cronbach's Alpha	CR	AVE
Pedagogical instructions	PI1	0.807	0.942	0.95	0.656
	PI2	0.8			
	PI3	0.792			
	PI5	0.818			
	PI6	0.843			
	PI8	0.836			
	PI9	0.791			
	PI10	0.88			
	PI11	0.803			
	PI12	0.721			
Social interactions	SI4	0.848	0.934	0.948	0.752
	SI5	0.916			
	SI6	0.909			
	SI7	0.858			
	SI8	0.802			
	SI9	0.866			
Technological support	TS1	0.844	0.949	0.96	0.799
	TS2	0.85			
	TS3	0.915			
	TS4	0.935			
	TS5	0.913			
	TS6	0.901			

Shallow cognitive engagement	SCE1	0.895	0.769	0.897	0.812
	SCE2	0.908			
Deep cognitive engagement	DCE1	0.728	0.877	0.911	0.672
	DCE4	0.826			
	DCE5	0.877			
	DCE6	0.849			
	DCE7	0.812			
Student Satisfaction	SS1	0.911	0.904	0.94	0.839
	SS2	0.92			
	SS3	0.917			
Academic Achievement	AA1	0.832	0.878	0.916	0.733
	AA2	0.865			
	AA3	0.899			
	AA4	0.827			

Table 2 indicated the indicator reliability (> 0.7), internal consistency reliability (Cronbach's Alpha > 0.7, and CR > 0.7) and the convergent validity (AVE > 0.5) of each construct (Hair Jr, et al., 2021). HTMT ratio intimation is also used to examine discriminant validity of scale. Each item's HTMT should be under 0.9 (Henseler, Ringle, and Sarstedt 2015), thus the constructs' discriminant validity in ensured (Table 3).

Table 3. Heterotrait–Monotrait Ratio of Correlations

Dimension	AA	DCE	PI	SCE	SI	SS	TS
Academic Achievement (AA)							
Deep Cognitive Engagement (DCE)	0.694						
Pedagogical Instructions (PI)	0.547	0.721					
Shallow Cognitive Engagement (SCE)	0.706	0.858	0.769				
Social Interaction (SI)	0.61	0.609	0.774	0.636			
Student's Satisfaction (SS)	0.815	0.635	0.597	0.643	0.614		
Technological Support (TS)	0.777	0.574	0.63	0.579	0.739	0.815	

Collinearity analysis: The variance inflation factor (VIF) should be lower 3 to avoid collinearity issues (Hair Jr, et al., 2021). Table 4 indicated that the bivariate correlation between TS and AA is larger than 3; however "if all VIFs resulting from a full collinearity test are equal to or lower than 3.3, the model can be considered free of common method bias" (Kock, 2015, p. 7). The full collinearity test results are illustrated in Table 4; all constructs' VIFs smaller than 3 indicate no collinearity issues. It could be concluded that the collinearity of the formative indicators in this study did not occur.

Table 4. Evaluating Collinearity of Scale and Model Fit

	AA	DCE	PI	SCE	SI	SS	TS
Academic Achievement (AA)							
Deep Cognitive Engagement (DCE)	2.446					2.378	
Pedagogical Instructions (PI)	2.911	2.23		2.23		2.909	
Shallow Cognitive Engagement (SCE)	2.342					2.306	
Social Interaction (SI)	2.768	2.756		2.756		2.764	
Student's Satisfaction (SS)	2.637						
Technological Support (TS)	3.112	2.008		2.008		2.073	

Table 5. A Full Collinearity Test

	Random
Academic Achievement (AA)	2.033
Deep Cognitive Engagement (DCE)	2.234
Pedagogical Instructions (PI)	1.258
Shallow Cognitive Engagement (SCE)	
Social Interaction (SI)	2.24
Student's Satisfaction (SS)	1.319
Technological Support (TS)	2.306
Deep Cognitive Engagement (DCE)	1.094

Structural Equation Modelling Analysis

According to (Hair, et al., 2019)yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM, the coefficient of determination (R2, which should be 0.25 < R2 < 0.9) and the path coefficients should be considered for assessing the structural model.

As can be shown in Table 6, the R2 values of DCE, SCE, SS, and AA were 0.463, 0.446, 0.621, and 0.646 respectively. The R2 values of 0.44 – 0.64 for the endogenous variables in the proposed structural model indicated fairly strong explanatory relationships among the study constructs, namely pedagogical instructions, social interactions, technological support, cognitive engagement, satisfaction, and academic achievements.

Table 6. R2 Values

Dimensions	R2	R2 Adjusted
Deep Cognitive Engagement (DCE)	0.463	0.454
Shallow Cognitive Engagement (SCE)	0.446	0.437
Student's Satisfaction (SS)	0.621	0.61
Academic Achievement (AA)	0.646	0.634

Hypotheses Testing

Table 7 and Figure 2 below indicate the path coefficients and p-values for each hypothesis. The results from Table 6 reveal that pedagogical instructions had direct positive medium effects on both deep and shallow cognitive engagements; deep cognitive engagement had a direct positive impact on academic achievement while shallow cognitive engagement did not have any impact on academic achievement and satisfaction. Interestingly, technical support had a direct positive impact on both academic achievements and satisfaction. Satisfaction was confirmed to have an effect on academic achievement. Among these correlations, the effect of technological support (TS) on satisfaction (SS) was strongest, followed by the impacts of pedagogical affordances on cognitive engagements, then TS on academic (AA), SS on AA. The effect of deep cognitive engagement on AA was the smallest. Social support did not have any correlations with students' satisfaction (p = 0.638 > 0.05), deep cognitive engagement (p = 0.648 > 0.05), or shallow cognitive engagement (p = 0.074 > 0.05) in a synchronous online learning modality.

Table 7. Hypotheses Testing Results

Hypothesis	Paths	Path Coefficients	p-value	Results
H1a	PI -> DCE	0.513	0.000	Supported
H1b	PI -> SS	0.025	0.789	Rejected
H1c	PI -> AA	-0.161	0.142	Rejected
H1d	PI -> SCE	0.530	0.000	Supported
H2a	SI -> DCE	0.055	0.592	Rejected
H2b	SI -> SS	-0.04	0.638	Rejected
H2c	SI -> AA	0.042	0.547	Rejected
H2d	SI -> SCE	0.061	0.648	Rejected
H3a	TS -> DCE	0.178	0.074	Rejected
H3b	TS -> SS	0.628	0.000	Supported
H3c	TS -> AA	0.333	0.017	Supported
H3d	TS -> SCE	0.133	0.251	Rejected
H4a	DCE -> SS	0.161	0.126	Rejected
H4b	DCE -> AA	0.201	0.029	Supported
H4c	SCE -> SS	0.116	0.187	Rejected
H4d	SCE -> AA	0.180	0.051	Rejected
H5	SS -> AA	0.331	0.001	Supported
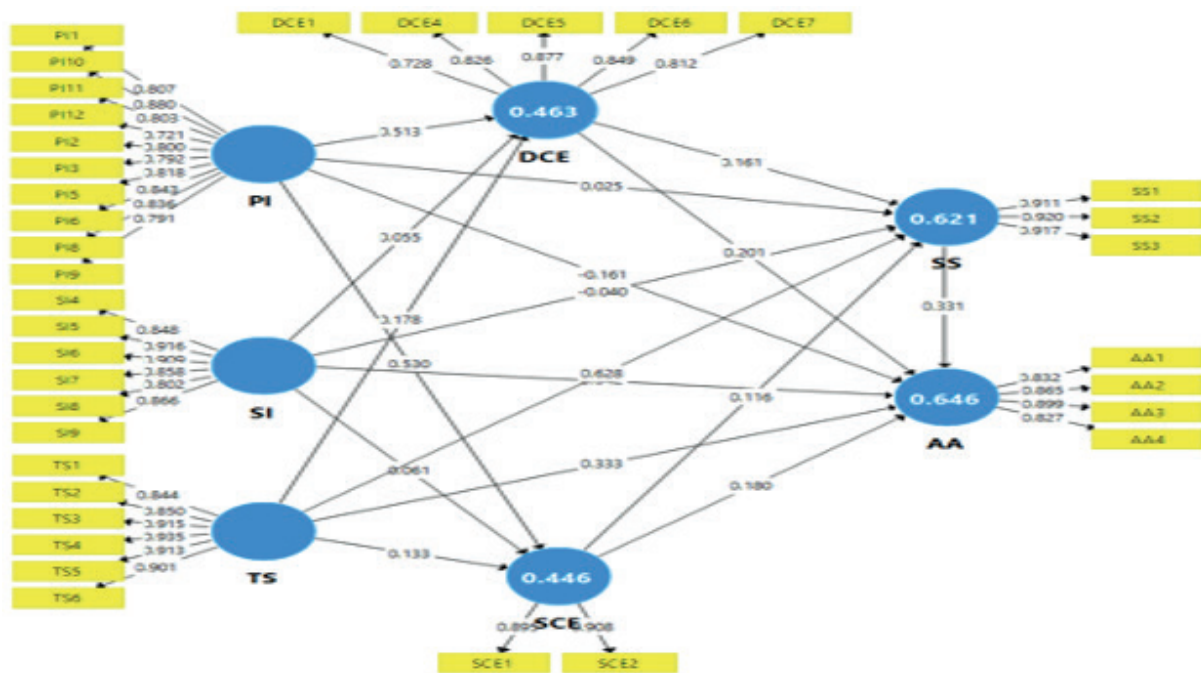
Figure 2: The results of path coefficients

DISCUSSIONS

The initial goal of the present study is to identify the impact of the synchronous online learning environment on students' cognitive engagement, satisfaction, and academic achievements. For this objective, the results of the study confirmed the roles of pedagogy play in students' cognitive engagement, which was supported by other studies (Lee and Koszalka 2016) Shi, Tong and Long, 2021; Zhong, et al., 2022; Wang and Stein, 2021; Zhang, et al., 2016), yet it ran counter to a study revealing that pedagogical affordance did not have effects on students' shallow cognitive engagement (Shi et al. 2021). It has been suggested that if the instructors encouraged students to take notes as a reminder for their later use in tackling future quizzes, this can contribute to their memorization of prior knowledge, and so it may enhance their involvement in the lessons. However, pedagogical affordance did not contribute to students' satisfaction and academic achievements in this study. This result contradicted the findings from (Almusharraf & Khahro 2020; Turk, Heddy & Danielson, 2022). A plausible explanation to this dichotomy can be that in this study, most of the participants studying in the Google Meet platform were required to set their cameras on during the online classes. The real-time interaction and ability to see face-to-face online may have contributed to their negative feelings about the synchronous learning online environment due to the feeling of freedom sacrifice. This should be unearthed in a further study to confirm the author's presumption. The study did not find any correlations between teaching presence and students' perceived academic achievements although previous studies indicated that teacher-students' interaction implied an enhancement on students' academic outcomes (Martin & Bolliger 2018; Richardson et al., 2016). One possible explanation is that the roles of teaching and testing may be taken into account (Dinh & Nguyen, 2022).

The study also unearthed the critical importance of technological support in promoting students' satisfaction (f value = 0.501), as well as its impact, albeit small, on students' academic achievements. This result was consistent with studies by Almusharraf and Khahro (2020) and (Aikina and Bolsunovskaya (2020). In addition, the study also lent support to previous research revealing that technological support did not have an impact on students' cognitive engagement (Shi et al. 2021), and was not reinforced by other studies (Wang, 2022; Ji, Park & Shin, 2022). In Wang's (2022) study, students in online courses valued the contribution of technological support to their cognitive engagement owing to their instructors' using various means of asynchronous teaching tools and media to tackle students' technical problems in learning. However, the participants showed a negative correlation between direct instruction and cognitive engagement. One

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explanation for these inconsistent findings with the current ones is that technological support would be appropriate for asynchronous online learning environments and that the participants of the current study did not encounter technical problems during their synchronous online learning. In the meantime, differences in pedagogical affordance could have led to students' differences in their perceived cognitive engagement. While the instructors in Wang's study mainly provided explicit explantions or solutions, the instructors in the current study primarily provided assistance or encouragement for students to get involved in the learning process.

Although social presence was supposed to be an essential factor in online learning (Tiedt, Owens, & Boysen, 2021) to promote students' engagement, it did not have any correlation with cognitive engagement in the current study, which was also confirmed by (Shi et al. 2021). This finding, however, was not aligned with previous studies which have signposted a positive correlation between social presence and satisfaction (Andel et al., 2020; Cheng & Chau, 2016; Richardson, et al., 2017), academic achievements (Al-dheleai et al., 2020) and learning engagement (Wang, 2022; Zhong, et al., 2022). This dichotomy can be elucidated that in a synchronous online environment with a camera on, students do not appreciate the interactions or collaboration with their peers. This provides academicians with pedagogical implications for their synchronous online-based teaching in designing activities or other supporting teaching tools that employ teacher-student interactions as well as peer interactions, which can foster students' academic achievements.

This study did not find any correlations between cognitive engagement and satisfaction which was reported by other studies (Chan et al. 2021; Ji, Park & Shin, 2022; Martin &s Bolliger, 2018; Meyer, 2014), yet it is aligned with prior studies pinpointing the close correlations between student engagement and academic outcomes (Bolliger & Halupa, 2018; Liu, et al., 2022). Although this result was not reinforced by some other research (Ohrstedt & Lindfors, 2019; Campbell & Cabrera, 2014), the finding adds subtle nuances of the role of deep cognitive engagement to students' perceived academic achievements in a synchronous online learning environment. Moreover, the role of technological affordance was found beneficial to students' emotional and behavioral engagement in other studies (e.g., Wang, 2022; Ji et al., 2022), which was not observed in the present research.

The study once again acknowledged the impact of satisfaction on academic achievement, even in a synchronous online learning environment where most of the students were participating online classes with their laptop camera on. This result was in line with previous studies (Dhaqane and Afrah, 2016; Gopal, Singh and Aggarwal, 2021; Dinh & Nguyen, 2022).

CONCLUSION AND LIMITATIONS

To the best knowledge of the author, this study is the first one examining the combined effects of online learning environments, especially the synchronous one, students' cognitive engagement on students' satisfaction and academic performances, utilizing the PLS-SEM technique. The results confirm the impact of pedagogical instructions in the synchronous online learning, technological support, and deep learning engagement on students' satisfaction and academic achievement. The study put forward the critical role of pedagogy even in online learning on students' cognitive engagement which is recognized as having an impact on students' academic outcomes. In addition, technological support is perceived to be crucial to online students' satisfaction and academic achievement although its correlation with students' cognitive engagement was not confirmed.

From the aforementioned findings, the current study, in terms of theoretical contribution, confirms the importance of teaching presence to students' learning process which has been well documented in Community of Inquiry (CoI) devised by Garrison et al. (2000), but now in a synchronous online learning where students' cameras are on. Regarding practical contribution, this study provides pedagogical implications for universities, educators, and instructors to consider online teaching activities and technological support in implementing synchronous online courses.

The current study acknowledges its limitations in terms of population scarcity, self-reported survey questionnaires, and a single design method. However, the study ensures the reliability and validity of the data quality through multi-progression analysis. The study also calls for further investigation of this issue

in a larger population as well as in the context of public universities where students' different backgrounds and motivations could be predictors for their cognitive engagement and satisfaction in a synchronous online environment. Furthermore, qualitative data collection such as on-site classes and/or interviews could help triangulate the findings. Finally, yet importantly, further studies should investigate instructors' specific synchronous online teaching activities in relation to other aspects of students' learning engagement such as social, emotional, and behavioral engagement.

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Yang, X., Li, D., Liu, X., & Tan, J. (2021). Learner behaviors in synchronous online prosthodontic education during the 2020 COVID-19 pandemic. *The Journal of prosthetic dentistry*, 126(*5*), 653-657.

Yeom, H.-A., Ahn, S.-H., & Kim, S.J. (2018). Effects of ethics education on moral sensitivity of nursing students. *Journal of Engineering and Applied Sciences*, 13(*Specialissue2*), 2903–2908.

Yoo, L., & Jung, D. (2022). Teaching Presence, Self-Regulated Learning and Learning Satisfaction on Distance Learning for Students in a Nursing Education Program. *International Journal of Environmental Research and Public Health*, 19(*7*).

Zhang, H., Lin, L., Zhan, Y., & Ren, Y. (2016). The impact of teaching presence on online engagement behaviors. *Journal of educational computing research*, 54(*7*), 887-900.

Zhong, Q., Wang, Y., Lv, W., Xu, J., & Zhang, Y. (2022). Self-Regulation, Teaching Presence, and Social Presence: Predictors of Students' Learning Engagement and Persistence in Blended Synchronous Learning. *Sustainability*, 14(*9*), 5619.

Zhou, L.H., Ntoumanis, N., & Thøgersen-Ntoumani, C. (2019). Effects of perceived autonomy support from social agents on motivation and engagement of Chinese primary school students: Psychological need satisfaction as mediator. *Contemporary Educational Psychology*, *58*, 323–330.

Zou, W., Hu, X., Pan, Z., Li, C., Cai, Y., & Liu, M. (2021). Exploring the relationship between social presence and learners' prestige in MOOC discussion forums using automated content analysis and social network analysis. *Computers in Human Behavior*, *115*, 106582.

THE BIBLIOMETRIC ANALYSIS OF THE AUGMENTED REALITY RESEARCH CARRIED OUT WITH THE EXPERIMENTAL METHOD PUBLISHED IN SCOPUS BETWEEN 2012-2022

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ABSTRACT

This study aims to make a bibliometric analysis of the augmented reality articles carried out with the experimental method between 2012 and 2022 in the Scopus database. To realize the aim of the research, 255 articles published between 2012-2022 were reached. The bibliometric data of 255 articles from the Scopus database were analyzed using VOS viewer 1.6.18 software and visualized with the Tableau software. According to the research findings, 255 articles were produced by researchers from 49 different countries. According to co-authorship networks, six different clusters were formed. National Taiwan University of Science and Technology is the leading institution in AR research with the experimental method. The 255 articles reviewed were published in 159 different journals. Interactive Learning Environments journal ranks first with 13 publications by far, while Computers and Education journal stands out with 878 citations in terms of the number of citations. When the keywords used in the articles were examined, it was seen that the concepts of virtual reality, mobile learning, motivation, and cognitive load came to the fore. The results obtained within the scope of the research were shared by discussing with other study findings obtained from the literature.

Keywords: Augmented reality, trends, bibliometric analysis, experimental study.

INTRODUCTION

Constant change and development in the fields of technology, economy, education, and sociology force the structure of human and society to change and transform. Especially the developments in the field of technology affect other fields immediately and strengthen each other. One of the innovative and remarkable technological developments today is augmented reality (Altinpulluk, 2018). As stated by Czerkawski and Berti (2021), augmented reality (AR) is among the emerging innovative technologies with significant potential for educators and students in the field of education. When the conceptual definitions made in the literature about AR technology are examined, it is seen that there are definitions that deal with this concept from different angles.

AR is a technology that provides interactive experiences by enriching analog, physical or real-world environments with virtual elements rather than a purely digital, virtual, or artificial environment as in virtual reality (Hollerer and Feiner 2004). Yuen, Yaoyuneyong, and Johnson (2011) developed this definition and

defined it as a technology in which users experience activities in the real-world environment, where they can interact with digital contents and applications developed via computer depending on a certain location. According to Richey (2018), it completes the real world with digital information through a visual interface.

AR technologies have become a usable and accessible technology in the field of education in parallel with the widespread use of mobile technologies (Sommerauer and Muller 2014). There are three types of AR technologies: markerless, marker-based, and location-based. Markerless AR uses features to track physical objects in the real environment that do not require markers. Marker-based AR technology uses a marker as a trigger. Location-based AR technology uses and observes computer-generated information on their mobile devices, based on their location determined by GPS (global positioning system) or WiFi-based positioning systems, and allows users to move around in the real environment (Wojciechowski & Celary, 2013).

When the research in the literature is examined, there are research findings that the use of AR technologies in the field of education is effective in increasing students' academic achievement (Akin, 2022; Akkus, 2021; Aslan, 2021; Eldokhny & Drwish, 2021; Gokce, 2022; Guler, 2020; Kaliyaperumal, Abd Wahab, Sagayam, Ambar, et al. Poad, 2020; Karadavut, 2021; Onur, 2021; Father Alagoz, 2020), skill development (Avci, 2022; Czerkawski and Berti, 2021; Eldokhny and Drwish, 2021), motivation boost (Akkus, 2021; Ciloglu, 2022; Onur, 2021), and self-efficacy (Ciloglu, 2022).

This research was carried out based on the need to determine the trends of experimental AR research and to provide scientific data about leading countries, institutions, journals, and authors. Before starting the research, it was examined whether there was a study evaluating the studies conducted within the scope of AR with content analysis, descriptive analysis, systematic review, extended literature review, meta-analysis, or meta-synthesis technique. In Table 1, information about the years of analysis of these studies, their titles, authors of the studies, the purpose of the studies, the databases used, and the number of analyzed publications are presented.

Table 1. Reviewing Studies on AR

Analyzed years	Title	Writer(s)	Purpose of the research & analysis dimensions	Databases	Number of analyzed publications
2007-2019	Research trends on the use of augmented reality technology in teaching english as a foreign language	Aysegul Takkac Tulgar, Rabia Meryem Yilmaz, Fatma Burcu Topu (2022)	The purpose of this study is to identify research trends in studies on AR in teaching English as a foreign language. Bibliometric mapping and content analysis were used to achieve this goal. The selected articles were discussed according to the dimensions of trend subjects, leading authors and journals, examined variables, methodologies, data collection tools, sampling methods and data analysis	Web of Science	49 articles
2015-2019	Learning strategies using augmented reality technology in education: Meta-analysis	Mohd Fadzil Abdul Hanid, Mohd. Nihra Haruzuan Mohamad Said, Noraffandy Yahaya (2020)	The purpose of this study is to identify most used learning strategies to encourage the integration of AR in different education levels. The selected articles were discussed according to the dimensions of learning strategies and levels of education (primary, secondary, or tertiary).	Web of Science, Scopus, Science Direct, Taylor Francis, Springer	17 articles

2006-2016	Determining the trends of using augmented reality in education between 2006-2016	Hakan Altinpulluk (2019)	The purpose of this study is to identify research trends in the use of augmented reality in education by examining the articles published within the scope of augmented reality in 8 educational technology journals within the scope of the Social Science Citation Index (SSCI).	Web of Science	58 articles
			The selected articles were discussed according to the dimensions of years, methods, data collection tools, education field, educational advantages, the type of applications used, technologies, assets used, physical environments.		
2015-2016	M-learning and augmented reality: A review of the scientific literature on the WoS Repository	Javier Fombona, Maria-Angeles Pascual-Sevillano, MariCarmen Gonzalez-Videgaray (2017)	The purpose of this study is to visualize the results of bibliometric analysis on m-learning and AR. The selected articles were discussed according to the dimensions of conceptualization of the phenomenon, development of new methodologies, motivation, spatial delocalization, and implementation in subject-matter areas	Web of Science	452 articles 500 presentations 12 reviews 18 books 12 summaries 62 others
2012-2016	The use of augmented reality in formal education: A scoping review	Fatih Saltan, Omer Arslan (2017)	The purpose of this study is to provide a comprehensive overview of research on AR technology in the context of formal education. The selected articles were discussed according to the dimensions of technology (being used in AR), pedagogical approach (being integrated with AR), affordances of AR applications, educational outcomes (arising from the use of AR), limitations (regarding the use of AR).	ERIC	23 articles
2007-2015	Advantages and challenges associated with augmented reality for education: A systematic review of the literature	Murat Akcayir, Gokce Akcayir (2017)	The purpose of this study is to present a systematic review of the literature on AR used in educational settings. The selected articles were discussed according to the dimensions of years, learner types, AR technologies used for educational purposes, advantages and challenges of AR in educational settings.	Web of Science	68 articles

2003-2013	Augmented reality trends in education: A systematic review of research and applications	Jorge Bacca, Silvia Baldiris, Ramon Fabregat, Sabine Graf (2014)	The aim of this study is to perform a systematic review of the literature on AR use in educational settings and to discuss trends, the vision towards the future and opportunities for further research in AR in educational settings. The selected articles were discussed according to the dimensions of the usage AR in the education field, the purposes of using the AR in education, advantages, limitations and effectiveness in education, types of AR, research sample, research method, time dimension, data collection method	Social Science Citation Index (SSCI) Science Citation Index (SCI)	32 articles
2003-2012	The application of augmented reality in online education: A review of studies published in selected journals from 2003 to 2012	Chia-Wen Tsai, Pei-Di Shen, Ya-Ting Fan (2014)	The purpose of this study is to review AR studies published in influential international journals between 2003 and 2012. The selected articles were discussed according to the dimensions of sample groups, subject domains, research methods.	Social Science Citation Index (SSCI), Science Citation Index Expanded (SCI-EXPANDED) ve Arts & Humanities Citation Index (A&HCI)	19 articles
2004-2011	Affordances of Augmented Reality in Science Learning: Suggestions for Future Research	Kun-Hung Cheng, Chin-Chung Tsai (2014)	The purpose of this study is to identify trends and focuses in current research on AR-related science learning (e.g., astronomy, chemistry, biology, or engineering) The selected articles were discussed according to the dimensions of the technical features, focus topics, participants, and affordances in science learning.	Web of Science, Scopus	12 articles

In addition to some common findings analyzed in the studies listed in Table 1, different findings were also included in the analysis within the scope of this study. In this sense, unlike the studies mentioned in Table 1, this study has dimensions that will be examined for the first time. In addition, unlike other studies, the findings and results obtained from this study are important in terms of being a pioneering finding to identify the leading countries, institutions, journals, and authors in experimental AR research and to determine the trend of experimental AR research. It is thought that this study, in which the bibliometric data obtained from the articles carried out with the experimental method within the scope of AR is evaluated by analysis, will also shed light on future research on the subject.

The purpose of this research was to review and visualize the AR journal articles carried out with the experimental method from the Scopus database. To identify trends in the field, the following research questions were addressed:

1. In AR research which is carried out with the experimental method
    a. What is the distribution by years?
    b. What is the distribution of leading countries and institutions?
    c. What are the leading journals and authors?

d. What is the co-authorship network map like?

e. What is the bibliometric keyword analysis like?

f. What is the co-citation analysis map like?

METHOD

Determination of Studies

Certain criteria were used in the selection of the studies that were described, analyzed, and evaluated within the scope of this research. These criteria are divided into three basic categories: historical, thematic, and place of publication. The first basic criterion category for the determination of the studies examined within the scope of this research is the dates of the research. As a historical criterion, the criterion of being published in the last 10 years was used. Since the research aims to analyze the AR research carried out with the experimental method, the keywords experimental, effect, and augmented reality were used when searching the database in the second criterion category.

(TITLE-ABS-KEY("augmented reality") AND TITLE-ABS-KEY(experimental) AND TITLE-ABS-KEY(effect)) AND PUBYEAR > 2011 AND (LIMIT-TO (DOCTYPE,"ar"))

In the third criterion category, a selection was made among the articles obtained from the results of the search made in the SCOPUS database.

Data Analysis

As a result of the search performed on the Scopus database on 29 May 2022, the bibliometric data of 255 articles were exported as CSV files. Bibliometric data of the articles are the author(s), article titles, journal titles, number of citations, links, institutions the authors are affiliated with, countries, and author keywords. In this study, VOSviewer software was used to determine the most frequently used keywords in experimental studies carried out within the scope of AR and to visualize the results. In addition, a network map of co-authors and co-occurrences was created using the full count method. VOSviewer 1.6.18 was used to visualize similarities in journal articles. VOSviewer is a software for creating and visualizing bibliometric networks. The collected data and the analysis process of the data were examined by two different researchers.

Limitations of the Research

This research has some limitations. The fact that the research was carried out only with bibliometric software can be considered a limitation. The future validation of the study can be ensured by examining and analyzing the articles one by one. The studies included in the bibliometric data analysis within the scope of this study are limited to 255 AR articles published in the SCOPUS database between 2012 and 2022. The search in the Scopus database was carried out on 29 May 2022. Articles published after this date in 2022 were not examined within the scope of this research. In this study, leading countries, institutions, journals and authors in AR research with the experimental method were analyzed.

FINDINGS

The findings obtained from the bibliometric data analysis of the publications reached through a systematic literature review are presented in the relevant headings to answer the research questions.

The Distribution of the Articles by Years

The distribution of the articles by years is shown in Figure 1.
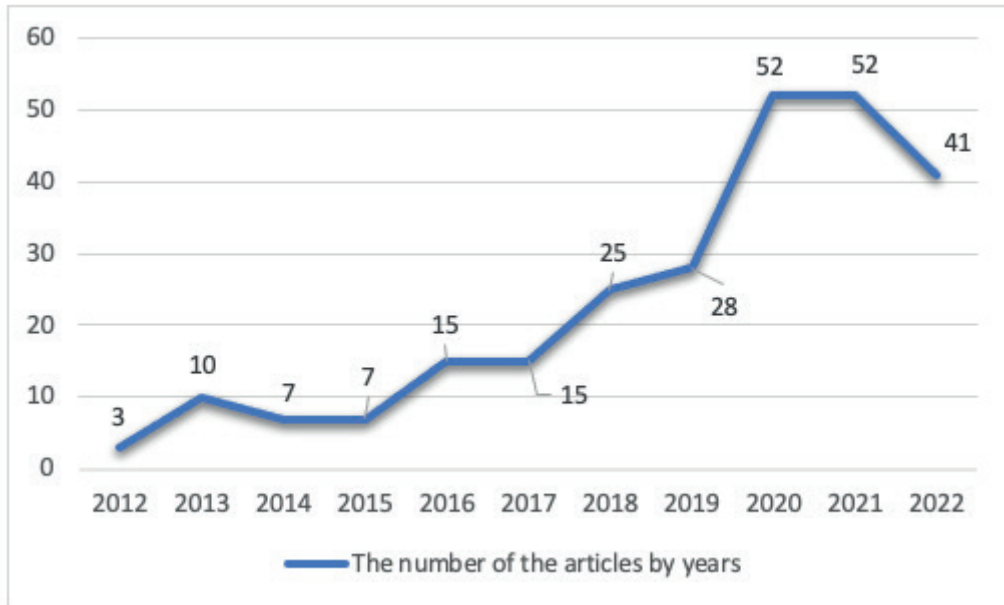
Figure 1. The number of the articles by years

When Figure 1 is examined, it is seen that the number of AR-related publications conducted with the experimental method from 2012 to 2022 has increased over the years. Since 2022 has not been completed yet, the number of articles published in 2022 seems low. However, despite the completion of half of 2022, it can be said that the number of published articles may exceed the number of articles published in 2021 at the end of the year.

Leading Countries and Institutions

To determine which countries the analyzed articles were addressed to, country data were downloaded from the Scopus database and visualized as bubble graphs in the Tableau data visualization program. Figure 2 shows the distribution of the published articles by country.
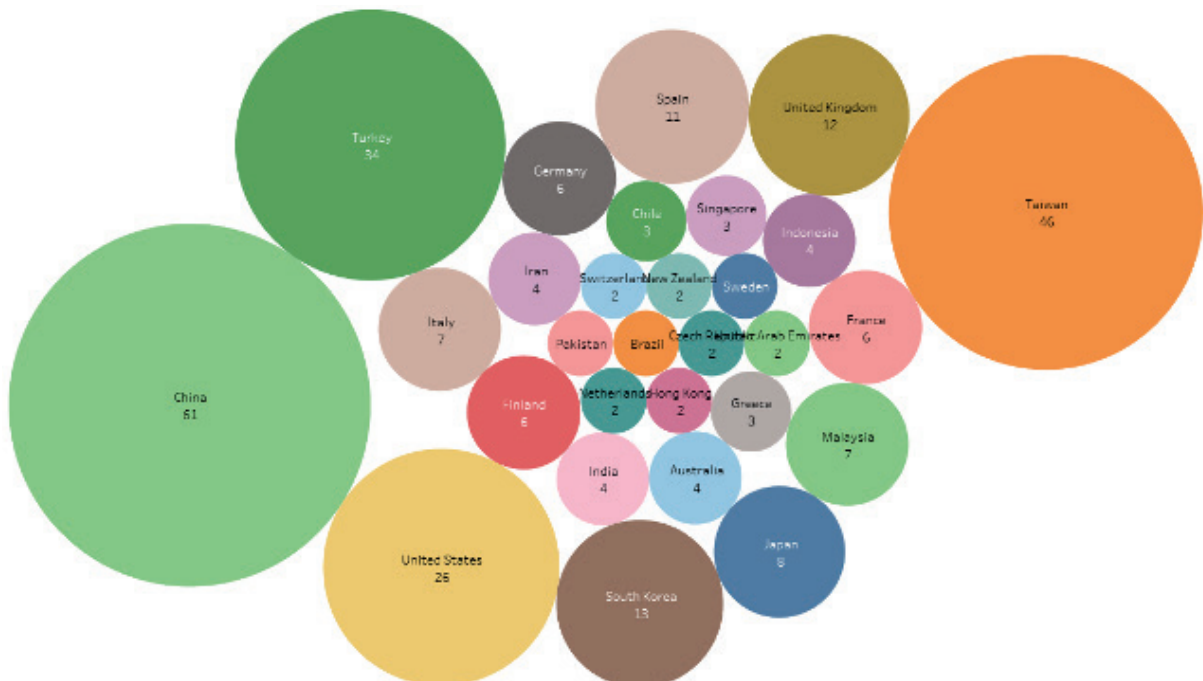
Figure 2. The Bubble Graph of the Distribution of the Articles by Country

Figure 2 includes 29 countries with at least two articles published. When the distribution of the experimental AR articles by country is analyzed, China stands out with 61 publications. Then, Taiwan (46) and Turkiye (34) are among the countries whose researchers publish more than 30 publications.255 articles were produced by researchers from 49 different countries.

The co-authorship network map by country is given in Figure 3. In the creation of the map, the analysis type was co-authorship, and the analysis unit was countries. The minimum number of documents and citations of a country is 2 (two). 27 out of 49 countries meet the threshold.
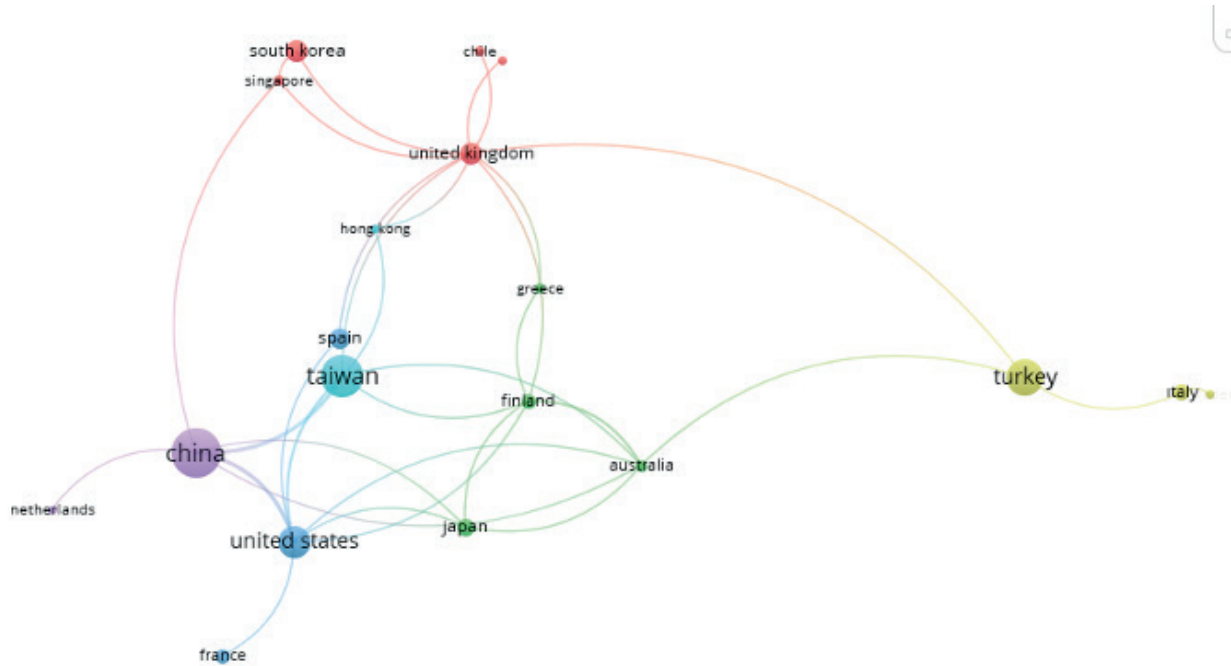
Figure 3. Co-authoring network map by the leading countries

The size of each node in the network is proportional to the total number of documents. The thickness of the connection between the nodes is proportional to the number of co-authorships. As seen in the network, 6 clusters were formed. The leading countries of these clusters are China (NDocuments=62, NCitations=380), Taiwan (ND=46, NC=743), Turkiye (ND=34, NC=881), USA. (ND=26, NC=528), Australia (ND=4, NC=73), England (ND=12, NC=242). China, the USA, Taiwan, and England acted as a connector in the network.

The institutions leading the AR research carried out with the experimental method are shown in Figure 4. These institutions are the National Taiwan University of Science and Technology (ND=9), National Taiwan Normal University (ND=9), Gazi University (ND=6), Universiti Teknologi Malaysia (ND=5), Ataturk University (ND=5), National Cheng Kung University (ND=4), Soochow University (ND=4).
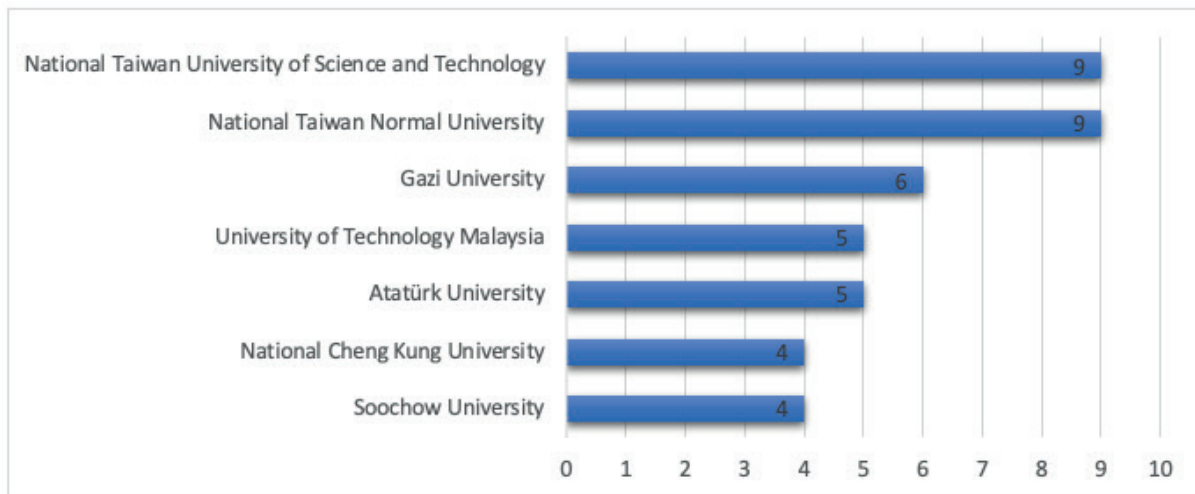
Figure 4. Leading Institutions

In order to identify the leading institutions, the VOSViewer network map created from bibliometric data was also created. Figure 5 shows the network map of the authors according to their institutions. In the creation of the network map, the type of analysis was co-authoring and the analysis unit was institutions. The minimum number of documents for an institution is 4. 7 out of 382 institutions meet the thresholds.

Figure 5. Co-authorship network map of leading institutions

In Figure 5, 6 different clusters seen in different colors were determined. In the clusters, there are prominent keywords such as the number of documents (Number of documents= ND), the number of citations (NC), and the total link strength (number of total links strength= NTLS). It was determined that only 7 of 382 institutions had co-authorship connections. Institutions leading the experimental AR research are included in the network map according to the authors' institutions and are respectively listed according to the total number of documents;, National Taiwan University of Science and Technology (ND=9, NC=424, NTLS=2) and National Taiwan Normal University (ND=9, NC=334, NTLS=2) are in the red cluster, Gazi University is in the blue cluster (ND=6, NC=335, NTLS=0), Ataturk University is in the green cluster (ND=5, NC=308, NTLS=0), Universiti Teknologi Malaysia (ND=5, NC=52, NTLS=0) is in the cyan cluster, National Cheng Kung University (ND=4, NC=63, NTLS=0) isin the yellow cluster and Soochow University is in the purple cluster (ND=4, NC=14, NTLS=0).

Leading Journals and Authors

The 255 articles reviewed were published in 159 different journals. In the ranking of 159 journals according to the total number of publications of the journals, it is seen that 123 journals made only 1 publication, and 132 articles were distributed among 36 journals. In this distribution, it has been determined that 19 journals have 2 publications, 4 journals have 3 publications, 3 journals have 4 publications, 4 journals have 5 publications, 3 journals have 6 publications, 1 journal has 7 publications, 1 journal has 9 publications and 1 journal has 13 publications. The order of the 10 journals with 5 or more publications according to the number of publications is given in Table 2 below.

Table 2. Top 10 journals according to the number of publications and citations

Journals	Citations, n	Articles, n
Interactive Learning Environments	304	13
Education and Information Technologies	45	9
IEEE Access	20	7
Computers and Education	878	6
Computers in Human Behavior	394	6
Journal of Computer Assisted Learning	77	6
IEEE Transactions on Visualization and Computer Graphics	64	5
Optics Express	30	5
British Journal of Educational Technology	29	5
Sustainability Switzerland	21	5

As can be seen in Table 2, among the journals with 5 or more publications, Interactive Learning Environments journal ranked first with 13 publications, Education and Information Technologies journal ranked second with 9 publications, and IEEE Access journal ranked third with 7 publications. Computers and Education, Computers in Human Behavior, and Journal of Computer Assisted Learning are journals with 6 publications. 4 journals with 5 publications are IEEE Transactions on Visualization and Computer Graphics, Optics Express, British Journal of Educational Technology, and Sustainability Switzerland. In terms of the number of citations, Computers and Education with 878 citations, Computers in Human Behavior with 394 citations, and Interactive Learning Environments with 304 citations stood out.

In this study, 255 articles were published by 828 authors. Figure 6 shows the co-authorship network map of the articles. In the creation of the network map, the analysis type was co-authoring, and the analysis unit was the authors. The minimum number of documents and citations for an author is 2. Out of 828 authors, 77 meet the thresholds.
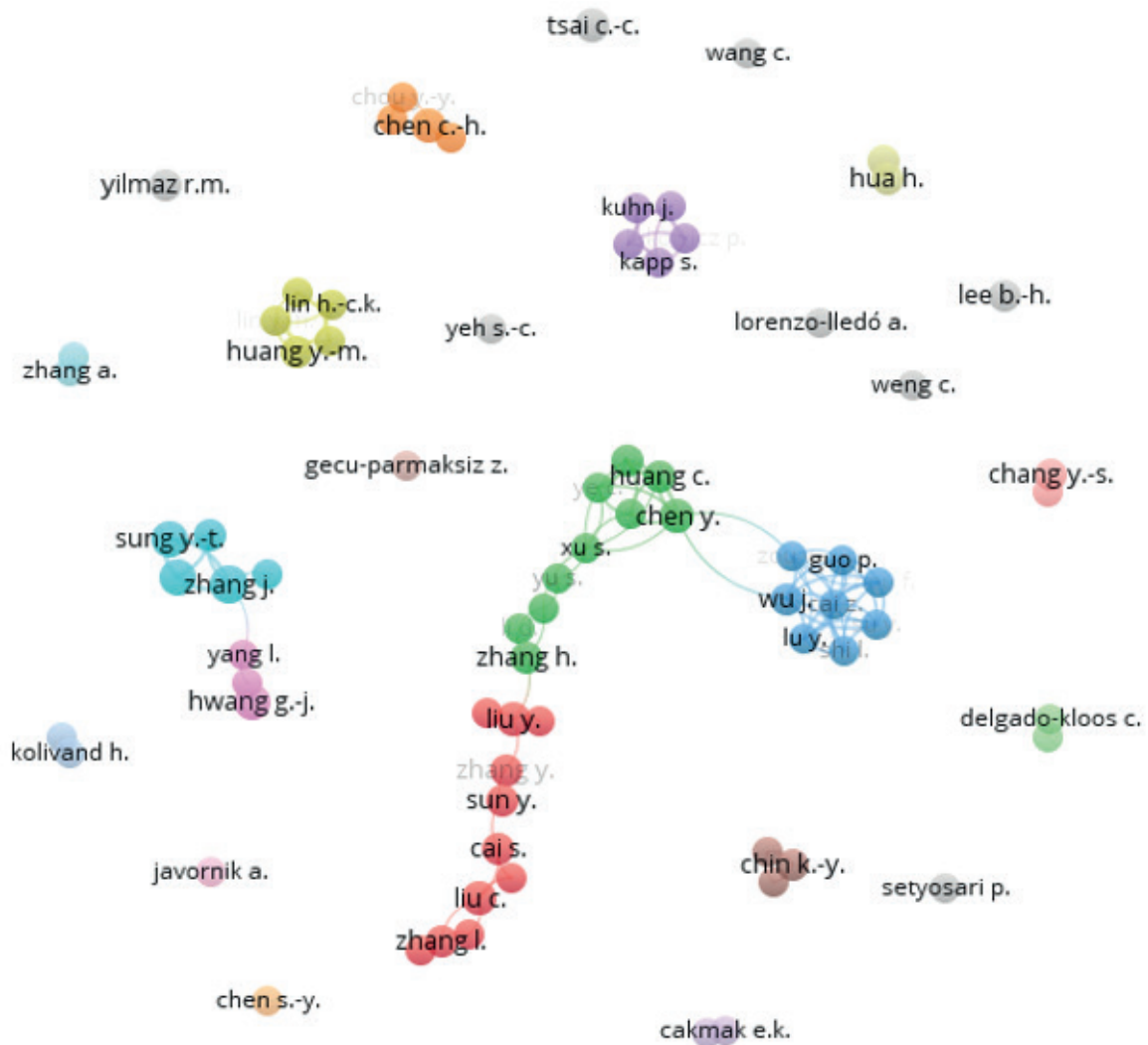
Figure 6. Co-authorship network map of 77 authors

As seen in the figure, many co-authorship clusters were formed among the authors. The 9 featured authors according to the total number of documents and the number of citations are given in Table 3 below.

Table 3. Top 9 authors by the number of publications and citations

Author	Institution and Country	Publications, n	Citations, n
Delgado-Kloos, Carlos	Universidad Carlos III de Madrid, Spain	2	330
Maria-Blanca, Ibanez	Universidad Carlos III de Madrid, Spain	2	330
Chang, Kuo-En	National Taiwan Normal University, Taiwan	5	262
Sung, Yao-Ting	National Taiwan Normal University, Taiwan	5	262
Hwang, GwoJen	National Taiwan University of Science and Technology, Taiwan	5	166
Yilmaz, Rabia Meryem	Ataturk University, Turkiye	3	152
Javornik, Ana	University of Bristol, United Kingdom	2	133
Cai, Su	Beijing Normal University, China	3	132
Zhang, Jia	National Taiwan Normal University, Taiwan	7	124

Looking at Table 3, Zhang J stood out with 7 articles, while Delgado-Kloos and Ibanez stood out with 330 citations. Of the 77 authors who meet the minimum 2 documents and 2 citation thresholds, 26 have an affiliate network. Looking at the featured authors in the co-authorship cluster, it seems that there is a connection between the co-authorship clusters between Chen, Y, and Wu, J.

As can be seen in Figure 7, in the co-authorship network map of 29 linked authors, 5 clusters were formed in the network. It is seen that Chen Y and Wu J stand out in terms of centrality and inter-cluster linking. When the connections between the co-authorship clusters are examined, it is seen that there is a connection between Cai S and Sung, Y, between Liu, Y and Zhang, H, between Xu, S and Chen, Y, and between Chen, Y and Wu, J.

Figure 7. Co-authorship network map of 29 affiliated authors

Trends in AR Articles with the Experimental Method

The co-occurrence analyzes of the author keywords were carried out using the full count method. Figure 8 shows a network visualization of the author's keyword map. In the creation of the network map, the analysis type was "co-occurrance" and the analysis unit was "author". The minimum repeat count of a keyword is 4. Of the 784 keywords, 14 meet the threshold.

Figure 8 shows the co-authored network map of the 14 keywords that meet the threshold.
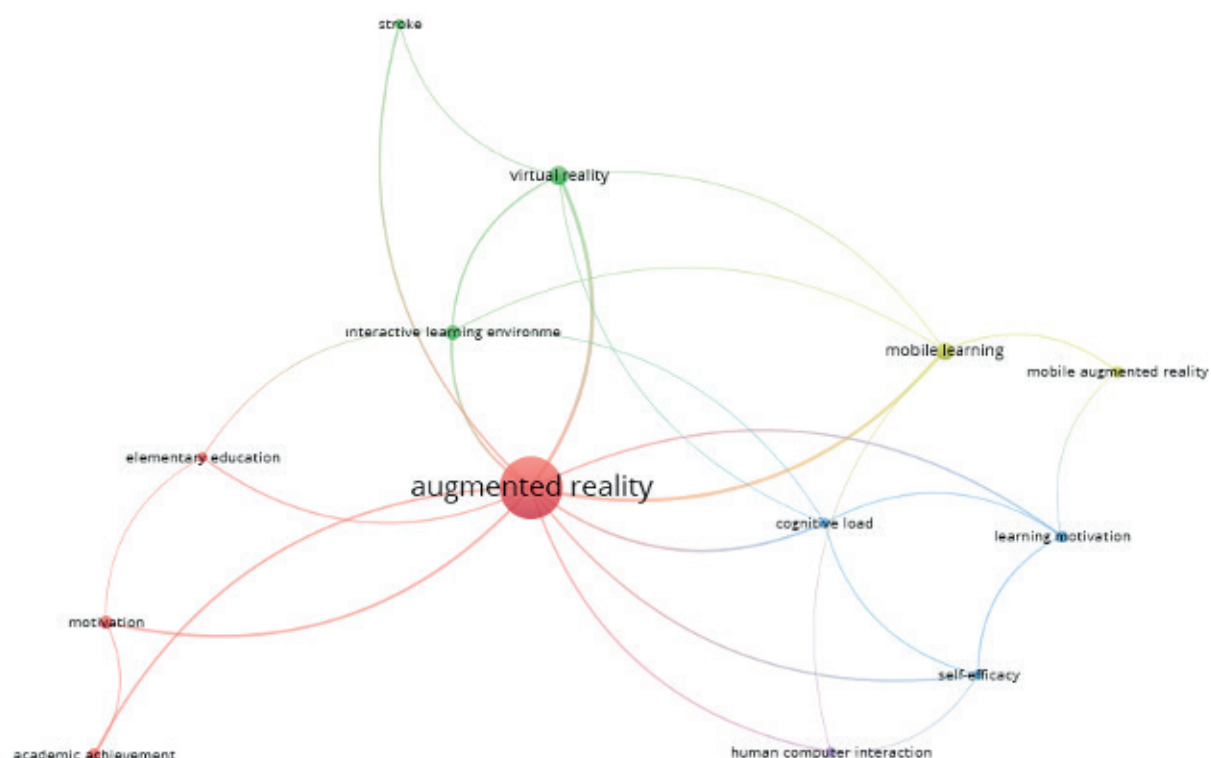
Figure 8. Co-occurrence map of authors' keywords

"Augmented reality", "Augmented reality (ar)" and "Mobile augmented reality" keywords were extracted from detailed keywords to identify trends in AR studies carried out with the experimental method. Figure 9 contains 11 keywords.

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Figure 9. Co-occurrence map of authors' keywords

In Figure 9, 4 different clusters seen in different colors were determined. In clusters, some keywords stand out according to the number of occurrences and the number of total link strength (NTLS). "Virtual reality" (Number of Occurrence=14, NTotal Link Strength=17) in the blue cluster and "mobile learning" (NO=13, NTLS=15) in the yellow cluster were the most important keywords in terms of their centrality, overall weight, density, and degree of overlap with the other topics. In other keywords, "motivation" (NO=7, NTLS=9) is given in the red cluster and "cognitive load" (NO=5, NTLS=11) is given in the green cluster.

In Figure 10, an overlay visualization map of the keywords according to years was created to reveal the change of AR studies carried out with the experimental method according to time.
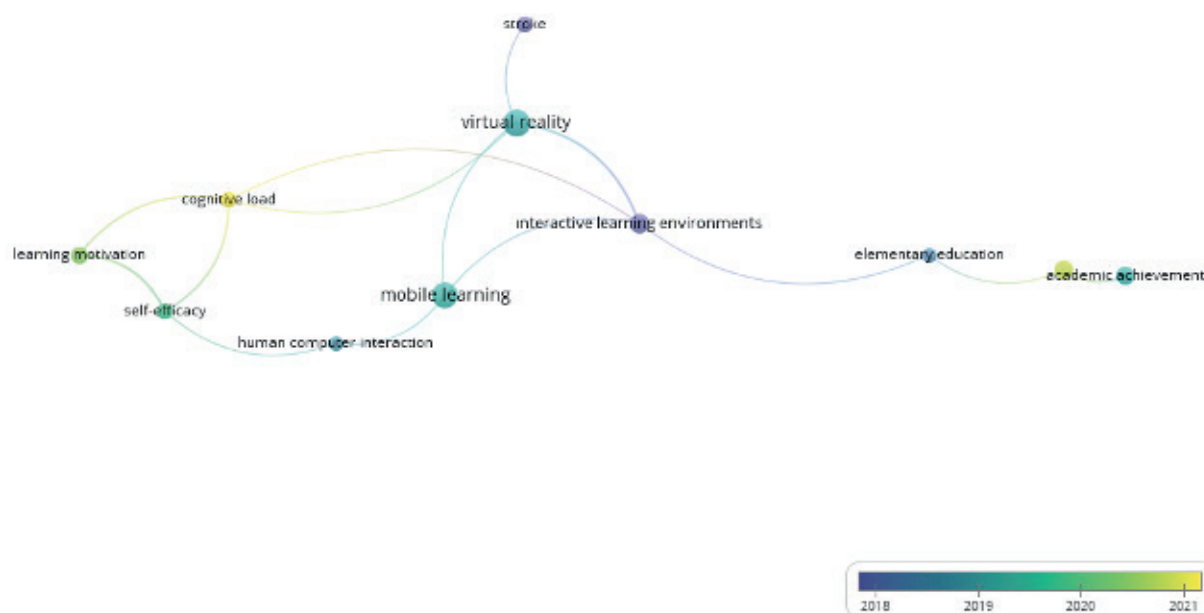
Figure 10. Keyword co-occurrence map of authors by year

According to the historical change, while the concept of "interactive learning environments" came to the fore in 2018; in 2019 the concepts of "mobile learning", "human-computer interaction", in 2020"self-efficacy", "learning motivation", "academic success", "academic success" and in current articles after 2021 the concepts of "cognitive load" and "motivation" come to the fore.

Bibliographic link analysis was performed to see a holistic network map of the articles. Figure 11 shows the visualization of the co-citation bibliometric analyzes of the articles.
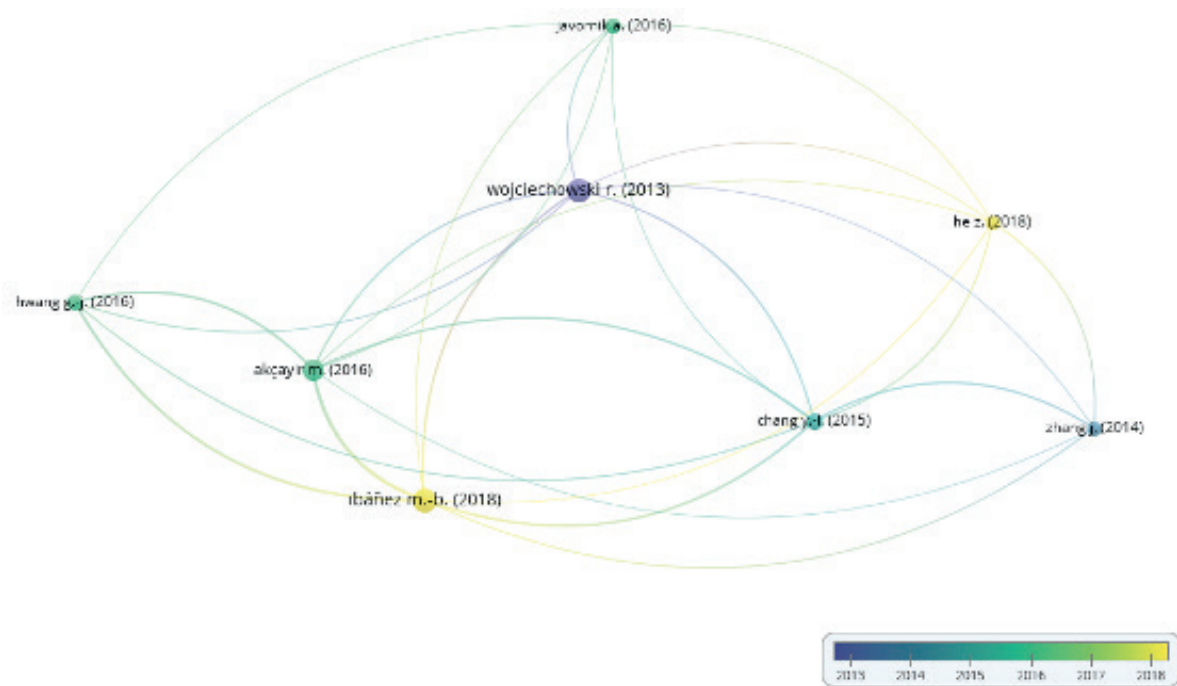
Figure 11. Bibliographic coupling analyses of articles

In the creation of the network map, the type of analysis was bibliographic coupling, the analysis unit was documents. Bibliographic coupling, like co-citation, is a similarity measure that uses citation analysis to establish a similarity relationship between documents. As expected, Figure 10 shows that older articles are more cited. Most cited articles with 100 or more citations are included in Table 4.

Table 4. Articles with 100 or more citations

Author(s)	Article Title	Year	Journal Name	Number of Citation
Wojciechowski R., Cellary W.	Evaluation of learners' attitude toward learning in ARIES augmented reality environments	2013	Computers and Education	279
Ibanez M. B., Delgado-Kloos C.	Augmented reality for STEM learning: A systematic review	2018	Computers and Education	272
Akcayir M., Akcayir G., Pektas H.M., Ocak M.A.	Augmented reality in science laboratories: The effects of augmented reality on university students' laboratory skills and attitudes toward science laboratories	2016	Computers in Human Behavior	231
Kucuk S., Kapakin S., Goktas Y.	Learning anatomy via mobile augmented reality: Effects on achievement and cognitive load	2016	Anatomical sciences education	156
Chang Y.-L., Hon H.-T., Pan C.-Y., Sung Y.-T., Chang K.-E.	Apply an augmented reality in a mobile guidance to increase sense of place for heritage places	2015	Educational Technology and Society	138
Javornik, A.	'It's an illusion, but it looks real!' Consumer affective, cognitive and behavioural responses to augmented reality applications	2016	Journal of Marketing Management	126
He Z., Wu L., Li X.R.	When art meets tech: The role of augmented reality in enhancing museum experiences and purchase intentions	2018	Tourism Management	109
Zhang J., Sung Y.-T., Hou H.-T., Chang K.-E.	The development and evaluation of an augmented reality-based armillary sphere for astronomical observation instruction	2014	Computers and Education	104

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Co-citation analysis of cited references performed with full counting method. In the creation of the network map, the type of analysis was co-citation, and the unit of analysis was cited references. The minimum number of citations of a cited reference was limited to 6. Of 11347 cited references, 22 meet the threshold. Figure 12 shows the co-citation network map of 22 connected articles.
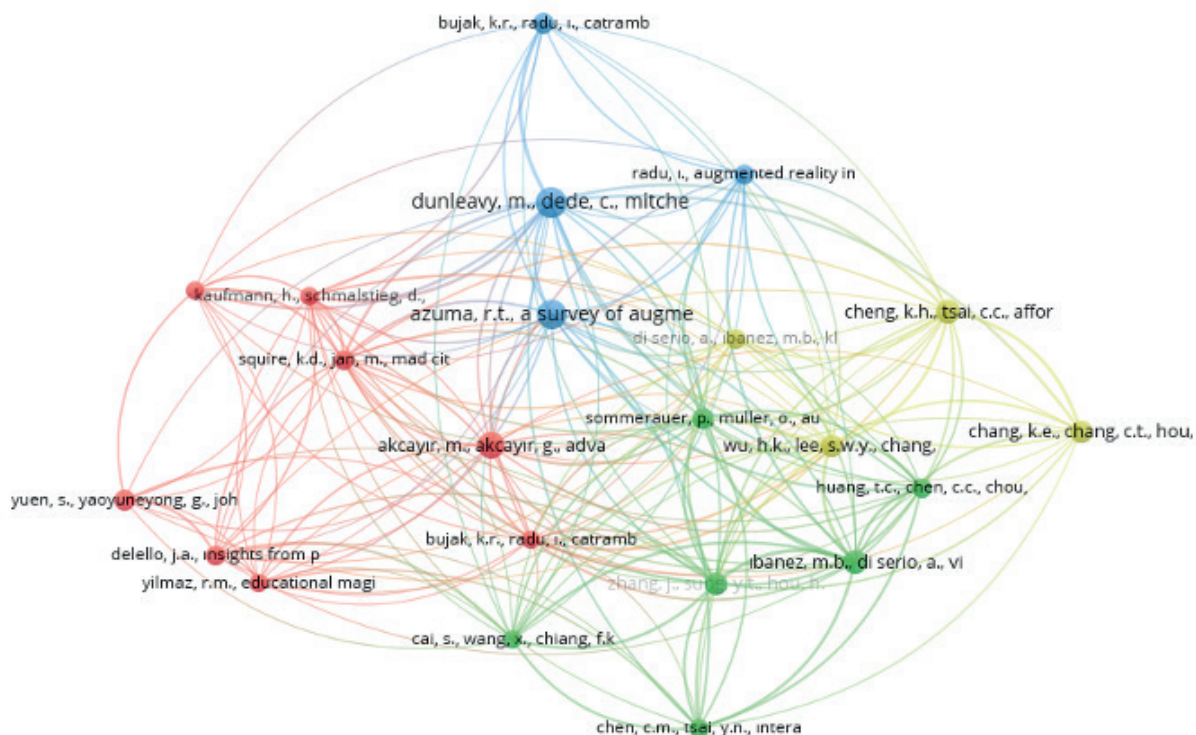
Figure 12. Co-citation analysis map of articles

The common citation analysis map includes 4 clusters. The distribution of articles into clusters is listed in Table 5.

Table 5. The distribution of articles to clusters based on co-citation

Article	Cluster	Weight <Links>	Weight <Total link strength>	Weight <Citations>
Akcayir, M., & Akcayir, G. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. *Educational Research Review*, *20*, 1-11.	Conceptual framework of augmented reality	17	29	13
Bujak, K. R., Radu, I., Catrambone, R., MacIntyre, B., Zheng, R., & Golubski, G. (2013). A psychological perspective on augmented reality in the mathematics classroom. *Computers & Education*, *68*, 536-544.	Conceptual framework of augmented reality	19	30	6
Delello, J. A. (2014). Insights from pre-service teachers using science-based augmented reality. *Journal of computers in education*, *1*(4), 295-311.	Conceptual framework of augmented reality	15	23	7

Kaufmann, H., & Schmalstieg, D. (2002). Mathematics and geometry education with collaborative augmented reality. In *ACM SIGGRAPH 2002 conference abstracts and applications* (pp. 37-41).	Conceptual framework of augmented reality	17	30	6
Squire, K. D., & Jan, M. (2007). Mad city mystery: Developing scientific argumentation skills with a place-based augmented reality game on handheld computers. *Journal of science education and technology*, *16*(1), 5-29.	Conceptual framework of augmented reality	18	34	7
Wu, H. K., Lee, S. W. Y., Chang, H. Y., & Liang, J. C. (2013). Current status, opportunities and challenges of augmented reality in education. *Computers & education*, *62*, 41-49.	Conceptual framework of augmented reality	13	20	6
Yilmaz, R. M. (2016). Educational magic toys developed with augmented reality technology for early childhood education. *Computers in human behavior*, *54*, 240-248.	Conceptual framework of augmented reality	13	17	6
Yuen, S. C. Y., Yaoyuneyong, G., & Johnson, E. (2011). Augmented reality: An overview and five directions for AR in education. *Journal of Educational Technology Development and Exchange (JETDE)*, *4*(1), 11.	Conceptual framework of augmented reality	11	14	8
Cai, S., Wang, X., & Chiang, F. K. (2014). A case study of Augmented Reality simulation system application in a chemistry course. *Computers in human behavior*, *37*, 31-40.	Development and implementation of augmented reality application	18	30	6
Chen, C. M., & Tsai, Y. N. (2012). Interactive augmented reality system for enhancing library instruction in elementary schools. *Computers & Education*, *59*(2), 638-652.	Development and implementation of augmented reality application	14	30	7
Huang, T. C., Chen, C. C., & Chou, Y. W. (2016). Animating eco-education: To see, feel, and discover in an augmented reality-based experiential learning environment. *Computers & Education*, *96*, 72-82.	Development and implementation of augmented reality application	14	30	7
Ibanez, M. B., Di Serio, A., Villaran, D., & Kloos, C. D. (2014). Experimenting with electromagnetism using augmented reality: Impact on flow student experience and educational effectiveness. *Computers & Education*, *71*, 1-13.	Development and implementation of augmented reality application	18	54	11
Sommerauer, P., & Muller, O. (2014). Augmented reality in informal learning environments: A field experiment in a mathematics exhibition. *Computers & education*, *79*, 59-68.	Development and implementation of augmented reality application	18	42	8
Zhang, J., Sung, Y. T., Hou, H. T., & Chang, K. E. (2014). The development and evaluation of an augmented reality-based armillary sphere for astronomical observation instruction. *Computers & education*, *73*, 178-188.	Development and implementation of augmented reality application	19	44	9
Azuma, R. T. (1997). A survey of augmented reality. *Presence: teleoperators & virtual environments*, *6*(4), 355-385.	Survey of augmented reality	18	37	16
Bujak, K. R., Radu, I., Catrambone, R., MacIntyre, B., Zheng, R., & Golubski, G. (2013). A psychological perspective on augmented reality in the mathematics classroom. *Computers & Education*, *68*, 536-544.	Survey of augmented reality	11	19	8

Dunleavy, M., Dede, C., & Mitchell, R. (2009). Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning. *Journal of science Education and Technology*, *18*(1), 7-22.	Survey of augmented reality	21	59	18
Radu, I. (2014). Augmented reality in education: a meta-review and cross-media analysis. *Personal and ubiquitous computing*, *18*(6), 1533-1543.	Survey of augmented reality	14	24	7
Chang, K. E., Chang, C. T., Hou, H. T., Sung, Y. T., Chao, H. L., & Lee, C. M. (2014). Development and behavioral pattern analysis of a mobile guide system with augmented reality for painting appreciation instruction in an art museum. *Computers & education*, *71*, 185-197.	Development augmented reality system	11	24	9
Cheng, K. H., & Tsai, C. C. (2013). Affordances of augmented reality in science learning: Suggestions for future research. *Journal of science education and technology*, *22*(4), 449-462.	Development augmented reality system	17	36	11
Di Serio, A., Ibanez, M. B., & Kloos, C. D. (2013). Impact of an augmented reality system on students' motivation for a visual art course. *Computers & Education*, *68*, 586-596.	Development augmented reality system	15	25	7
Wu, H. K., Lee, S. W. Y., Chang, H. Y., & Liang, J. C. (2013). Current status, opportunities and challenges of augmented reality in education. *Computers & education*, *62*, 41-49.	Development augmented reality system	19	45	9

The study subjects of the articles in the 4 clusters given in the table were analyzed. Cluster 1 "Conceptual framework of augmented reality" colored in red, Cluster 2 "Development and implementation of augmented reality application" colored in green, Cluster 3 "Survey of augmented reality" colored in blue, Cluster 4 colored in yellow is named as "Development augmented reality system".

CONCLUSION AND DISCUSSION

It has been determined that the number of AR-related publications conducted with the experimental method from 2012 to 2022 has generally increased over the years. 2014 was the only year in which the number of published articles decreased compared to the previous year. It was determined that the same number of articles were published in 2015, 2017, and 2021 as in the previous year. When the survey studies on AR in the literature are examined, the finding that the number of publications on AR with experimental methods has increased over the years shows similarities with the research findings obtained by Altinpulluk (2019), Icten and Bal (2017), and Turker (2021). Altinpulluk (2019) revealed that there has been a sudden increase in the number of publications in the field of AR since 2013, by examining the articles published within the scope of AR in 8 educational technology journals within the scope of the Social Science Citation Index (SSCI) between 2006-2016 and trying to determine the trends in AR use in education. He also pointed out that the interest in the use of AR applications in education has increased. Icten and Bal (2017) analyzed 34 academic studies on AR, published in 27 international and national journals between 2010 and 2016, using the content analysis method, and stated that although there were close values from 2010 to 2016, there was a slight increase over the years. Turker (2021), as a result of his research on the use of AR technology in education, in which he examined the postgraduate theses published in the field of education, stated that the number of thesis studies on AR technology from 2014 to 2019 increased.

It was stated that 255 articles published on AR, which were carried out with the experimental method, were produced by researchers from 49 different countries. When the distribution of articles by country is

examined, China has come to the fore with 61 publications. Then, Taiwan (46) and Turkiye (34) are among the countries with researchers with more than 30 publications. China, Taiwan, and Turkiye are found as the leading countries by the number of documents. Similar to this research finding, Altinpulluk (2019) stated that Taiwan is the country where the most studies were carried out within the scope of AR, and after Taiwan, research was carried out in the USA, Spain, South Korea, Turkiye, and China, respectively. Co-authorship network map of leading countries formed 6 clusters. China, Taiwan, Turkiye, the USA, Australia, and England are leading these clusters. China, the USA, Taiwan, and England acted as connectors in the network.

According to the total number of documents, the leading institutions in the published articles on the experimental AR were the National Taiwan University of Science and Technology, National Taiwan Normal University, Gazi University, Universiti Teknologi Malaysia, Ataturk University, National Cheng Kung University, Soochow University, respectively. When the survey studies on AR were examined in the literature, no other findings similar to this one was found.

It was determined that 255 articles published on AR, which were carried out with the experimental method, were published in 159 different journals. Interactive Learning Environments journal was in first place with 13 publications. In terms of the number of citations, Computers and Education with 878 citations, Computers in Human Behavior with 394 citations, and Interactive Learning Environments with 304 citations stood out. In terms of the number of publications, Icten and Bal (2017) obtained a finding similar to the finding about leading journals in AR research conducted with the experimental method. Icten and Bal (2017) found that the 34 studies they examined were published in 27 different journals, and the first three journals in which the most studies were published were IEEE Access, Computers & Education, and Procedia, respectively. In terms of the number of citations, a finding similar to the finding about the leading journals in AR research conducted with the experimental method was made by Takkac Tulgar et al. (2022). To show the research trends in the studies on AR in teaching English as a foreign language by using bibliometric mapping and content analysis, Takkac Tulgar et al. (2022) found that the Journal of Computer Assisted Learning stood out with 106 citations in terms of the number of citations, the British Journal of Educational Technology journal came second with 54 citations and Computers and Education was third with 19 citations.

In terms of the number of citations, a finding similar to the finding about leading authors in AR research conducted with the experimental method was found by Takkac Tulgar et al. (2022). Takkac Tulgar et al. (2022) found that Liu, T.Y. stood out with 106 citations among 16 authors with at least 10 citations in studies on AR in teaching as a foreign language. It was similarly seen in the research by Takkac Tulgar et al. (2022) that Ibanez, M., Hwang, G., and Cai, S., were among the most cited authors.

For the research trend of augmented reality research carried out with experimental method; authors' keywords co-occurrence, overlay visualization of authors' keywords and bibliographic coupling analyses of articles were conducted. As a result of the authors' keywords co-occurrence analysis, the prominent concepts were "Virtual reality" and "mobile learning". Those were the most important keywords in terms of their centrality, overall weight, density, and degree of overlap with the other topics.

When the survey studies on AR in the literature are examined, a finding similar to the finding that mobile learning comes to the fore was found by Ozaydin Aydogdu and Eryilmaz (2019) and Takkac Tulgar et al. (2022), a finding similar to the finding that the concept of virtual reality comes to the fore was obtained by Altinpulluk (2019) Ozaydin Aydogdu and Eryilmaz (2019) analyzed the studies on AR in higher education in Turkiye and abroad in Eric and Academic Search Complete databases with descriptive analysis method. They stated that the most used AR technology in researches conducted both in Turkiye and abroad is mobile technologies and AR applications are oriented towards the mobile field. Takkac Tulgar et al. (2022) determined that the most used keywords in studies on AR in foreign language teaching are mobile learning, Aurasma, and mobile games. Altinpulluk (2019) stated that the most used keywords in the articles published within the scope of AR are interactive learning environments and virtual reality, respectively.

When the change of keywords according to years is analyzed in the analysis, while the concept of "interactive learning environments" came to the fore in 2018, in 2019 the concepts of "mobile learning", "human-computer interaction", in 2020 "self-efficacy", "learning motivation", "academic success", and in current articles after 2021 the concepts of "cognitive load" and "motivation" come to the fore. A finding similar

to was found by Takkac Tulgar et al. (2022). Takkac Tulgar et al. (2022), in their studies on AR in foreign language teaching, found that mobile learning, gamification, and mobile games became the focus of research in 2015-2019.

Bibliographic link analysis was performed to see a holistic network map of the articles. As a result of the analysis, it was determined that older articles received more citations. It can be said that this finding is quite an expected one.

Co-citation analysis of articles revealed 4 clusters. These clusters are named "Conceptual framework of augmented reality", "Development and implementation of augmented reality application", "Survey of augmented reality" and "Development augmented reality system". When the survey studies on AR are examined in the literature, it can be stated that such an analysis has never been made.

Recommendations

Based on the findings obtained from this study, some recommendations were made. Fields such as mobile learning, human-computer interaction, and interactive learning environments, which have become trend topics, can be determined as research topics in prospective research on AR technologies to be carried out with the experimental method. At the same time, since it is seen that the keywords used in these studies focus on the concept of secondary education, it can be suggested that future experimental studies be carried out in higher education institutions.

This research focuses on leading countries, institutions, journals, and authors in experimental studies. The bibliometric data obtained from this research provides important findings to the researchers who will work experimentally with AR technologies about the researches of the authors who have the most references, the researches of the authors who have done the most research, in which countries and in which institutions these researches are studied more, in which journals the studies in this field are published the most, and which topics in these researches are discussed. Methodological variables such as research model, sample size, target population, which were not examined in this study, can be examined in future studies.

Since AR is a new technology, it has been determined that its effects on learning success, self-efficacy, performance, cognitive load, and motivation have been examined more in experimental studies. However, it was seen that there was no study on variables such as readiness, attitude, perception, and acceptance. For this reason, future research can be recommended to investigate teachers' and students' readiness, attitude, perception, and acceptance levels toward AR technologies.

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DISRUPTIVE CHANGE AND LEARNING INNOVATIONS: CHALLENGES AND OPPORTUNITIES FOR UNIVERSITAS TERBUKA

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ABSTRACT

Since Covid-19 pandemic hit the world at the beginning of 2020s, various efforts were made to keep the education process running while still enforcing protocols to prevent the spread of Covid-19. Online learning then becomes an option and inevitability for educational institutions to break the chain of spreading the virus. Furthermore, distance education (DE) has become the best choice for educational institutions in carrying out their learning activities. For Universitas Terbuka (UT), online learning is nothing new. As a pioneer of DE in Indonesia, UT is one step ahead of having strong experiences in open and distance learning practices and placing online learning as one of the main modes of learning delivery. Thus, UT has succeeded in making various breakthroughs ranging from registration, digital learning materials, synchronous and asynchronous academic support services, up to an online examination system equipped with online proctoring. The DE innovation developed by UT becomes a reference for other universities in Indonesia. With an integrated learning management system (LMS) and the number of alumni reaching up to 1.9 million, UT is able to carry out the Indonesia's government mandate in opening the widest possible access to education for Indonesian citizens, both domiciled in Indonesia and abroad.

Keywords: Disruptive change, learning innovations, UT's challenges and opportunities.

INTRODUCTION

Disruptive change cannot be separated from the concept of disruptive innovation developed and introduced by Clayton Christensen (Meyer, 2010) which discusses how technology, inventions, and ideas are developed and then oppose traditional knowledge. This term is used to describe the process of changing the simple application of a product or service that can penetrate the top of the market and even replace established competitors. Based on this situation, disruptive innovation has inevitably influenced the rapid development of using technology in higher education in which people, especially educators, have to think in new ways in order to survive and thrive. In other words, it is very visible that capabilities in terms of performance relative to alternative approaches in higher education practices have also rapidly changed (Manyika, Chui. Bughin, Dobbs, Bisson, & Marrs, 2013). For instance, the technology innovations are implemented in

virtual chemistry labs and continued to increase for four reasons, i.e. continuing improvement, the ability of students, faculty, and parents to select a learning pathway that suits individual learners, teacher shortages, and falling costs (Christensen, Horn, & Johnson, 2008).

During the last three years, the impacts of Covid-19 outbreak have become significant considerations in practicing distance higher education as Bozkurt, et.al (2020) describes the examples, such as limited opportunity for education because of school shutdowns, the online learning practices resulting in "incomplete" learning, and health issues. Therefore, some ways to survive during the pandemic are required by schools and educators, such as building support communities, sharing tools and knowledge, and listening to different voices. This is in line with a study conducted by Masalimova, et.al (2022) in which students stated that online learning has the potential to take advantage of all the limitations caused by pandemic situations. Moreover, a study conducted by Coman, Tiru, Mesesan-Schmitz, Stanciu, & Bularca (2020) shows that the students also asserted that distance learning has also given benefits in their learning process since it enables them to conduct their own learning at any time and from any location as well as benefits both accomplishment and learning.

Universitas Terbuka (UT) is the 45th state university in Indonesia inaugurated by the President of the Republic of Indonesia on September 4, 1984, based on Presidential Decree Number 41 of 1984. UT was designed as an open university to apply distance learning. As a distance teaching university (DTU) applying open and distance learning (ODL), UT is expected to be the pioneer as well as the innovator of DTUs in Indonesia. Since its establishment, there are three main missions carried out by UT, i.e. (1) providing equitable access to higher education for community members, (2) increasing competence and academic qualifications for teachers and other government officials as well as people who are already working, and (3) providing opportunities for high school graduates/equivalent who are not accommodated in other state universities.

An open education system means that UT in providing education prioritizes and emphasizes the openness of the system which is the operationalization of the philosophy of lifelong education (without admission selection, without age restrictions, without geographical location restrictions, does not require a certain educational background, without a high school diploma year limit, without study period limits, and are multi-entry-multi-exit). This concept is in line with Laal & Salamati (2012) discussing lifelong learning as "a continuously supportive process which stimulates and empowers individuals to acquire all the knowledge, skills, and dispositions throughout one's life to foster well-being". Meanwhile, the distance education system means that UT encourages independent learning for students to be able to direct themselves in organizing the learning process and in utilizing the learning assistance services provided by UT. UT's system and operations are designed to offer educational programs that can be accessed in a flexible, borderless and inclusive way. Thus, the open and distance education (ODE) system implemented by UT results in system flexibility and ensures public access to higher education in accordance with UT's missions.

In general, UT education service modes can be categorized into two types. The first type is blended learning, designed as a type of learning service that combines face-to-face and digital approaches. This type is used by students who have low or limited access to infrastructure and ICT facilities that are not yet adequate in utilizing ICT for learning activities. This group of students usually comes from remote or suburban areas and is mostly more than 50 years old. Whereas the second type is fully online which is mostly used by students who have adequate access to ICT infrastructure and facilities as well as literacy and cultural skills. This group of students is usually young and comes from urban areas. As a state university that implements an ODE system, UT continues to improve the quality of both types of services and optimize the practice of modern ODE.

Since 2020, UT's students have been dominated by those who are under 29 years old as illustrated below.
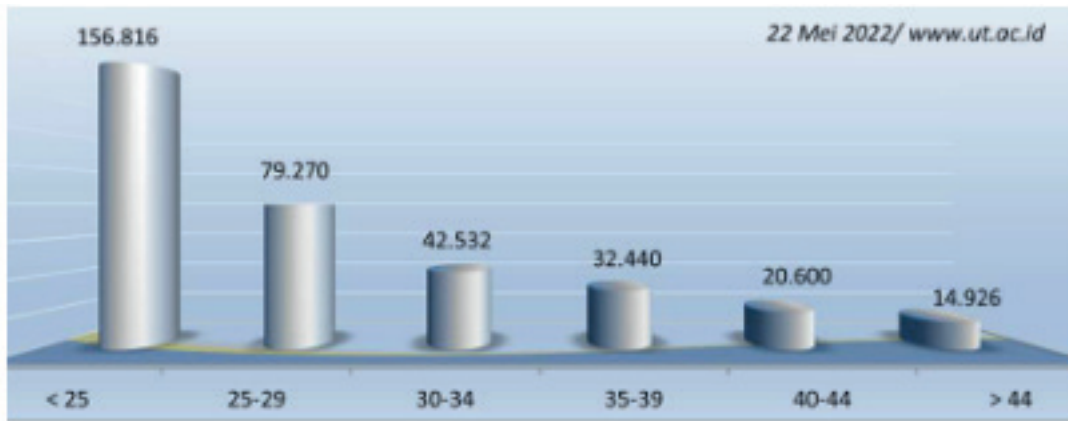
Figure 1. Student Body Based-on Ages

From the total active students of 346,584, as many as 156,816 or 42,25% are under 25 years old and 79,270 or 22,87% are between 25-29 years old. This shows that the number of millennial students as well as Generation (Gen) Y and Z of UT are increasing. One of the challenges faced by UT is how to facilitate the learning needs as well as learning styles of those of Gen Y and Z in which online interaction has become their way of life, especially for Gen Z students or known as i-gen (Black, 2010).

After implementing the ODE for 38 years and producing up to 2 million alumni, UT has proven to be able to reach groups of people who are unreachable by the face-to-face higher education institutions which also offer 'limited' access in age and length of study. UT services can be accessed through 39 regional offices spread across 34 provinces to serve students who live in 515 districts/cities in Indonesia and 1 overseas student service center to serve students in more than 50 countries or about 91 cities throughout the world. Furthermore, the ODE system implemented by UT has proven to be able to fulfill the mandate of the 1945 Constitution and embody the Government's obligation to provide access to higher education for all. This is in line with UT's motto "Making Higher Education Open to All".

THE DEVELOPMENT OF E-LEARNING IN INDONESIA AND ITS CONDITION DURING COVID-19 PANDEMIC

The Gross Enrolment Rate (GER) for higher education in 2021, which only reached 30.85%, shows the low number of people receiving higher education due to the quality of government services in providing access to higher education (Statista, 2022). Therefore, the presence of DTUs is considered to open access to higher education services that existing conventional or face-to-face universities cannot afford. Furthermore, universities are also encouraged to make it efficient in that learners no longer merely rely on the existence of regular classes and conventional learning. Therefore, a blended learning system, online learning, and collaborations with other universities are needed. This allows cost effectiveness to produce more optimal output as well as encourage a revolution in the role of universities, lecturers, and students. Furthermore, organizations also consequently employ the learning management system (LMS) for driving skill development, employee training, and succession planning and are further used as learning platforms for compliance training by a government agency as well as an onboarding tool for new hires (Market Research, 2020).

Additionally, the government has prepared several regulations to encourage the development of the distance education system. Through Law Number 12 of 2012, the government explicitly states that the distance education system can be carried out in single mode and dual mode. This was confirmed by the issuance of Regulation of the Minister of Education and Culture Number 109 of 2013 concerning the Implementation of Distance Education in Higher Education. The regulation provides an opportunity for all eligible universities to offer distance learning. Distance education and online learning are no longer a monopoly market controlled by UT but has been the priority of the government's programs to be implemented in several face-to-face or conventional universities. However, UT has realized that its presence is not a threat to UT but a prospective partner to synergize with each other to build the nation through distance education.

Their presence can be a stimulus and trigger to build a better work culture, build learning infrastructure facilities with the support of digital technology, and provide more quality learning programs and services.

The Corona Virus Disease (Covid-19) pandemic has had a real impact on education resulting in the implementation of e-learning that was a necessity and the best choice for the world of education to ensure the fulfillment of student's rights to education. It forces educational institutions to shift the learning process from face-to-face to online mode with limited resources and in a very short time. Regarding this matter, the Indonesian government has taken several precautions to maintain health and safety in preventing the Coronavirus. Among them with the issuance of the Circular Letter of the Directorate General of Higher Education of the Ministry of Education and Culture of the Republic of Indonesia Number 1 of 2020 concerning the Prevention of the Spread of Covid-19 in Higher Education.

The application of social and physical distancing is required in all educational activities. This was further strengthened by the issuance of the Circular Letter of the Minister of Education and Culture of the Republic of Indonesia Number 3 of 2020 concerning the Prevention of Covid-19 in Education Units. Furthermore, the next Circular Letter of the Minister of Education and Culture of the Republic of Indonesia Number 4 of 2020 was launched concerning Implementation of Educational Policies in the Future Emergency Spread of the Covid-19. All educational institutions must implement distance learning by the conditions of their respective universities. Students are encouraged to learn from home with online learning, both synchronously and asynchronously, through various platforms. On March 20, 2020, no less than 832 universities announced that they had moved their classes from face-to-face (classroom) to online learning. Various educational institutions have begun to use technology and implement online learning systems to support learning activities. Moreover, the pandemic situation forced all the students and teachers to do "Learning from Home". There are three important points stated in the regulation. First, learning from home must be conducted through online platform/distance learning and should give meaningful learning experiences. Second, the learning activities must be focused on life skills. Third, the learning activities must be conducted based on students' motivation and conditions by considering the access and facilities gaps (Moeldoko, 2020).

Figure 2. Online Learning Portals Officially in Partnerships with Indonesian Government

Source: The Ministry of Education and Culture - Indonesia

This policy has consequently raised several important issues. First, the teaching paradigm has shifted from face-to-face to virtual classrooms for all levels of education. The shift here is not only done by transferring the materials into digital formats but also by applying some rules. Online learning must be formulated and implemented carefully while prioritizing the interests and needs of students. Therefore, online learning apart from being a solution will also pose considerable challenges for lecturers at face-to-face universities. Second, the increasing requests for a synchronous platform. The delay in various activities due to physical distancing policies forced people to work and study remotely from home. This has led to a surge in the use of synchronous platforms such as Microsoft Teams, Zoom, and others. Third, the development of asynchronous learning platforms called learning management system (LMS) was done by institutions, such as Moodle, D2L, Edmodo, Blackboard, canvas, and others.

LMS is software specifically designed to create, distribute, and manage educational content so that it can improve the learning process, and be more productive and cost-effective. Last, educators created resource sharing such as digital learning materials, MOOCs, and OER (MIT's Open Courseware, UKOU's OpenLearn, SUAKA UT). A study on the practice of online learning in higher education institutions in Indonesia shows that during the pandemic, 91.79% of respondents did online learning, while 7% did blended learning. Furthermore, the following table illustrates the use of LMS during the pandemic.

Table 1. Online Platforms

Learning Management System (LMS)	Percentage
Moodle	30.19%
Blackboard	1.81%
TalentMS	2.05%
Dacebo	0.48%
LMS365	11.71%
Unknown	22.46%
Others	31.28%

Source: Padmo, Ardiasih, & Idrus (2020)

The table shows the percentage of applying the LMS to conduct the online learning in which 30.19% of the respondents use Moodle LMS, while 11.71% apply LMS365 for their learning activities. Others stated that they use Blackboard, TalentMS, and Dacebo. From further explanation provided in the questionnaire, some respondents mentioned some other platforms they used during the pandemic situation, such as Microsoft Teams, Google Classrooms, WhatsApp Web, Eldiru (local), Schoology, and internal platforms developed by the institutions. On one hand, many organizations offer free online courses, making it easier for people to gain knowledge. On the other hand, other problems also arise related to infrastructure (internet/access point), equipment, broadband quality, lack of competence (technology literacy & online pedagogy), and financial problems.

The presence of DTUs is to open access and expand the capacity of conventional universities as well as to assist in overcoming conventional universities in terms of numbers that tend to be relatively exclusive, and not inclusive (Hall, 1996). Thus, it is expected that the presence of DTUs can "boost" the GER of higher education institutions in Indonesia which existing conventional universities cannot afford (Ministry of Education, 2019). Previously, the Indonesian government has issued various regulations and guidelines that encourage universities to implement distance and online learning, but not many universities took advantage of them. One of the programs is the Indonesia Online Learning System called SPADA. It is a program launched by the Directorate General of Learning and Student Affairs of the Ministry of Research, Technology, and Higher Education that aims to increase equitable access to quality learning in higher education. This program encourages the development and dissemination of open educational resources (OERs), massive open online courses (MOOCs), and open courses. Furthermore, the establishment of the Indonesia Higher Education and Research Network (INHERENT) in 2004 also played a significant role

as a network of universities from various provinces in Indonesia. There are more than 300 universities that are members of INHERENT and allow them to share online learning models that can be enrolled by all students in Indonesia.

THE PRACTICE OF E-LEARNING AT UNIVERSITAS TERBUKA: OPPORTUNITIES AND CHALLENGES DURING AND POST COVID-19 PANDEMIC

Along with the rapid development of ICT and its use in learning as well as the Ministry of Research, Technology and Higher Education's policies in increasing access and capacity of higher education services, universities that apply face-to-face mode are encouraged to offer e-learning or distance learning as a mode of learning. UT as an ODL institution with its experiences is mandated by the government to support the implementation of distance learning in other universities, including some responsibilities, such as (1) UT's contribution in accelerating the increase in higher education GER to reach 1 million students, (2) strengthening UT's identity as a Cyber University, and (3) providing supports to other universities and other institutions in implementing distance learning.

The Covid-19 pandemic that occurred in Indonesia in early March 2020 required UT to adapt and modify several learning services for students. These services include adaptation of the delivery of learning materials, student learning support services, and examinations. UT with a history of ODL has shown its readiness to overcome the Covid-19 issue because it has implemented the system for about 38 years. UT provides services to students who have various socio-economic backgrounds, domicile areas, cultures, and needs throughout Indonesia and in various parts of the world. This diversity is responded to by providing various modes of learning services that are accessible and in accordance with the needs of students. Thus, UT must optimize online services to students by taking advantage of advances in information technology. Several strategies carried out by UT during the pandemic were optimizing web-based learning support services for students, both asynchronously and synchronously. With the physical distancing policy launched by the Government, UT has taken a policy to switch from face-to-face services to online services. The policy is stated in UT Rector's Regulation Number 326 of 2020 concerning the Academic Policy of Universitas Terbuka in the Period of Preventing the Spread of Covid-19 in 2020. Therefore, to improve the quality of the students' independent learning process, UT provides learning supports services in the form of tutorials, consisting of online tutorials (tuton), face-to-face (f2f) tutorials, webinar tutorials (tuweb), radio tutorials, and TV tutorials.

Regarding the implementation of e-learning at UT, some adaptations and modifications were conducted in providing learning support services for students. A significant change is that face-to-face tutorials were not undergone for the first semester of 2020 since this mode of tutorial cannot be implemented during the pandemic and it has been changed to a synchronous online tutorial service, i.e. tuweb. The following table shows the comparison of the number of tutorial services provided before the Covid-19 pandemic in 2019 and during the Covid-19 pandemic.

Table 2. Tutorial Classes and Students Participating before and during the Covid-19 Pandemic

Types of Tutorial	Before Covid-19 2019		During Covid-19 2020	
	Number of Class/ courses	Number of students/courses	Number of Class/courses	Number of Students/courses
Face to face Tutorial	29,674	593,471	0	-
Webinar Tutorials (tuweb/synchronous)	21	192	26,573	476,703
Online Tutorials (tuton/ asynchronous)	12,580	596,010	12,991	605,237

Source: Center for Student Support Services of UT

The table shows that during Covid-19 pandemic the f2f tutorials were not conducted and the number of tuton classes as well as the number of students enrolled in the tuton classes increased significantly compared to those before the pandemic.

Table 3. Number of Tutors of the Faculties (2021-2022)

FACULTIES	TOTAL NUMBER OF TUTORS/INSTRUCTORS						NUMBER OF TUTORS/ INSTRUCTORS FROM PROFESSIONALS AND INDUSTRIES					
	TUWEB		TUTON		PRACTICE/ PRACTICUM		TUWEB		TUTON		PRACTICE/ PRACTICUM	
	2021 smt 2	2022 smt 1	2021 smt 2	2022 smt 1	2021 smt 2	2022 smt 1	2021 smt 2	2022 smt 1	2021 smt 2	2022 smt 1	2021 smt 2	2022 smt 1
Faculty of Education and Teacher Training (FKIP)	5.561	5.540	1.650	1.724	3.629	3.411	2.245	2.351	358	478	1.404	1.398
Faculty of Science and Technology (FST)	100	98	451	605	153	148	52	56	179	251	67	76
Faculty of Law, Social and Political Science (FHISIP)	1.473	1.433	2.221	2.416	88	77	658	655	1.391	1.448	35	35
Faculty of Economics (FE)	1.120	1.085	1.638	1.729	46	17	604	603	1.040	1.087	23	8
Total	8.254	8.156	5.960	6.474	3.916	3.653	3.559 (43%)	3.665	2.968 (50%)	3.264	1.529	1.517
Postgraduate Programs			432	386					70 (16%)	61 (16%)		

Source: Universitas Terbuka (2022)

Based on the table, it is visible that there was a fluctuation in the number of tutors/instructors from the second semester of 2021 (July-December) and the first semester of 2022 (January-June). Furthermore, due to the absence of f2f tutorials, UT optimized the recruitment of tutors/instructors from professionals and industries, reaching 50% for undergraduate programs and 16% for postgraduates. This is in line with UT's support of the Ministry of Education, Culture, Research, and Technology programs called "Freedom Learning Freedom Campus" in which one of the aims is to involve professionals or industries in order for the learners to gain some knowledge and experiences directly from them.

The e-learning or online learning mode has been applied to almost all aspects of educational services, from registration to graduation. In terms of academic products, students can take advantage of digital teaching materials as well as interactive digital teaching materials besides printed teaching materials. In 2002 United Nations Educational, Scientific and Cultural Organization (UNESCO) introduced the use of Open Educational Resources (OERs) to support online teaching and learning. OERs are any educational resources or learning, teaching, and research materials in any format and medium that reside in the public domain or are under the copyright that has been released under an open license, that permits no-cost access, re-use, re-purpose, adaptation, and redistribution by others (Butcher, Kanwar, & Uvalic-Trumbic, 2011; UNESCO, 2019). Therefore, there are advantages to using OER, i.e. 1) no need to pay royalties or license fees during the process of teaching and learning, and 2) both educators and learners are more productive. The use of OER has taken important parts in education, particularly in e-learning.

Since OER is highly recommended due to its flexibility and accessibility to support the teaching and learning process, UT as a DTU has applied the use of OERs since 2010. The OERs called Sumber Pembelajaran Terbuka (SUAKA) UT accessed by UT students as well as public provided by UT to support the students' learning activities are in the forms of web supplements, virtual reading room and online journals available in

the digital library, UT radio, UT-TV, "Guru Pintar Online" Portal (Portal for teachers), online journals, and MOOCS, as shown in the following table.

Table 4. Access to UT Open Educational Resources (SUAKA UT)

Kinds of UT Open Learning Sources	2019	2020	2021	2022 Semester 1
UT Radio	55,933	41,335	36,275	20,696
Web Suplements (Open Courseware)	133,504	99,422	73,612	43,206
"Guru Pintar online" Portal	109,680	3,833,294	2,060,333	1,238,039
Digital Library dan UT-TV	4,030,013	8,742,024	9,557,385	5,043,813
Online Journals	294,264	415,552	551,338	282,870
MOOCs	59,228			95,368
Jumlah	**4,623,611**	**13,131,647**	**12,278,943**	**6,723,992**

Source: Universitas Terbuka (2022)

The table shows that since the pandemic, access to SUAKA UT has increased dramatically. UT provided open access to the main learning materials through the virtual reading room that can be accessed in UT digital library, not only for UT students but also for the public. In 2019, the access to SUAKA UT, especially the digital library and UT-TV reached 4,030,013 and during the pandemic, it increased every year, i.e. 6,723,992 in June 2022 and predicted to be more than 13 million access. Furthermore, the functions of UT-TV are not limited to sharing learning materials but also broadcasting some webinars conducted by UT from the level of study programs to the university. One of the UT webinar series conducted since 2020 by inviting some experts in ODL as well as educational technology from academicians and government officials is called the knowledge sharing forum (KSF) reached 26 series in August 2022.

To measure students' competency achievement, there are various types of exams provided by UT, such as paper-based exams, online exams, and online proctoring exams. However, during the pandemic, the needs of online exams increased dramatically since all the paper-based exams were cancelled due to the pandemic situation. Therefore, in the early pandemic students were provided the course assignments to be accessed online as the parts of student evaluation both online tutorial participants and those who learn without being enrolled in online tutorials. In 2021, UT optimized the student exams by providing take home examinations or THE that can be accessed at https://the.ut.ac.id. The THEs are provided in the form of essay writing and opened book that students have to follow some regulations regarding their integrity, such as avoiding plagiarism. The following is the results of THE in 2021 semester 1 (June 2021).
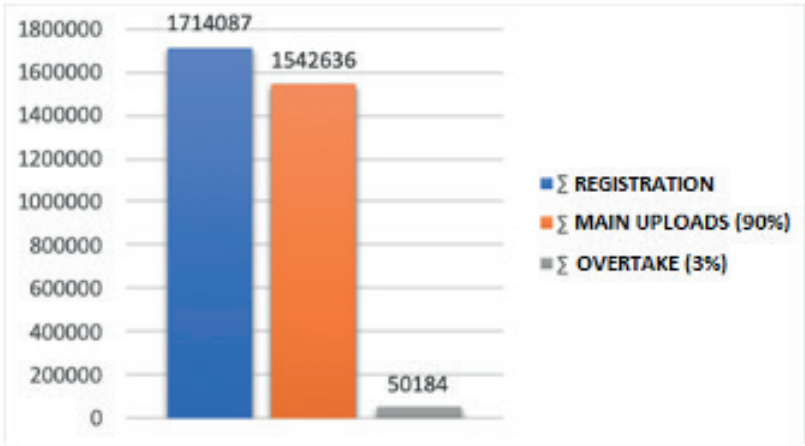
Figure 3. THE Uploads of the First Semester taken in June 2021

Source: Universitas Terbuka (2022)

It was predicted that tertiary education systems can emerge stronger from the Covid-19 crisis in Asia (Yarrow, 2020). Consequently, governments and institutions need to consider some aspects to build new innovations and possibilities for the recovery from the crisis. All educational institutions are getting their campuses and procedures ready for a "new normal" to welcome staff and students back. However, it seems that online learning will still take place in the new normal era. Therefore, educational institutions need to develop and diversify infrastructure, increase collaboration, and provide flexible learning pathways. Educational institutions must create a more agile and flexible system for digital pedagogy and develop low-tech innovations to give learning opportunities to students who are disadvantaged.

The development of UT as a cyber university aims to make UT strengthen its service network to assist agencies and institutions (colleges, ministries, official universities) that will organize information technology-based programs, as an effort to accelerate the increase in the GER of higher education and to meet various educational needs of the community, both degree and non-degree programs. As the pioneer of DE in Indonesia, UT is one of the most visited state universities in Indonesia, both from within and outside the country to conduct comparative studies on distance learning as well as e-learning. The trust of other universities in the quality of the ODL implemented by UT is also increasing with the number of other university students participating in the Loose Courses offered by UT. Furthermore, UT was also appointed as the Chair of the Consortium for the development of the Indonesian Cyber Education Institute (ICE Institute) together with 14 leading universities in Indonesia, including the University of Indonesia, Institute of Technology Bandung, IPB University, Gajah Mada University, Institute of Technology Surabaya, Binus University, Diponegoro University, and any others. ICE Institute is an online learning marketplace that offers more than 350 choices of courses in an effort to disseminate knowledge (ICE Institute, 2022). ICE Institute also collaborates with service providers Massive Online Open Courses (MOOCs) such as EDX to provide opportunities for students and lecturers to take part in online learning in this leading marketplace.

Regarding the role of UT as a DTU, UT need to provide some supports to many universities in Indonesia that do not have adequate infrastructure and human resources for online learning. For this reason, UT is committed to actively providing solutions to help other universities in Indonesia in implementing DE. Among other things, this commitment is embodied through some ways. First, by provide an online learning service platform or Learning Management System (LMS) which is intended for state or private higher education institutions in Indonesia based on their needs. LMS is a software application used by educational institutions to manage online learning classes. With this technology, distance is no longer an obstacle in the implementation of education. The LMS used by UT is Moodle. Moreover, UT also provides assistance through training on the use of Moodle and the provision of a data management center for those institutions which want to use it in online learning but are constrained by infrastructure problems. Second, providing open free access and use of more than 1,300 digital teaching materials in the UT Virtual Reading Room (RBV) for students and lecturers from various other universities in the country. This digital BA can be accessed from various places via an internet connection using a laptop, computer, tablet, or smartphone. Third, by regularly organizing online scientific communication forums (webinars) aimed at disseminating knowledge about the implementation of distance education in Indonesia and the world. On a national scale, UT organizes a Knowledge Sharing Forum (KSF) and on an international scale UT collaborates with several experts and institutions from abroad to organize the Asian Association of Open Universities (AAOU) Webinar. This forum aims to explore ideas and best practices of the distance education system in international world. Consequently, in this uncertain era of the COVID-19 pandemic, UT has also shown empathy and concern by providing relaxation of Single Tuition Fees for students affected by the pandemic, including various kinds of educational scholarships. Up to 2022, the tuition assistance provided by UT reaches around 16 billion Rupiah.

CONCLUSION

UT in the Era of Adapting to New Habits has strengthened its identity as the leader of Distance Teaching Universities in Indonesia because of UT's 38-year experiences in implementing a distance learning system by utilizing advances in information technology. During the Covid-19 pandemic, UT has succeeded in carrying out various innovations in the academic and operational fields. Technology-based distance learning is proven

to be able to expand access to quality higher education. The Covid-19 pandemic is also a challenge as well as an opportunity for UT to continue to provide optimal distance education services to students while maintaining the quality of its services. The increasing trend of UT students in 2021 and 2022 indicates UT's success in carrying out the transformation to respond to the disruption caused by the pandemic.

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DISTANCE EDUCATION STUDENTS' INDULGENCE IN SIX SHARP PRACTICES: GENERAL LINEAR MODELLING OF PREDICTIVE PARAMETERS

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ABSTRACT

This study examined the degree to which students indulge in six prominent misconducts in Distance Education Institutions (DEIs). The study also quantified how class size, instructional delivery and institutional policies predict students' indulgence in sharp practices using a general linear modelling approach. A sample of 871 participants was drawn from 1,742 final-year students across two DEIs in Nigeria. A structured questionnaire was used for data collection. The questionnaire had acceptable psychometric estimates of dimensionality, content and construct validity, as well as reliability. Sharp practices such as cheating, plagiarism, falsification, impersonation, and arm-twisting were more prevalent in large classes, whereas only inducement was higher in small classes. Class size influenced students' indulgence in sharp practices in DEIs. Instructional delivery and institutional policies negatively predicted students' indulgence in the six sharp practices. Almost all the six sharp practices correlated positively and significantly, except for impersonation and inducement. Therefore, distance education students who cheat, plagiarize, arm-twist, falsify records, induce lecturers, and promote impersonation are more likely to indulge in other forms of sharp practices. It was concluded that large class sizes, poor instructional delivery, and poorly implemented institutional policies promote sharp practices among distance education students. Based on this conclusion, key policy and research implications are discussed.

Keywords: Academic misconduct, cheating, corruption, examination malpractice, unethical practices.

INTRODUCTION

Sharp behaviors among students have become a global phenomenon, attracting the attention of academics worldwide. Consequently, it has become one of the most extensively debated themes in the literature on goal accomplishment (Hafeez et al., 2013; LaDuke, 2013; Tee & Curtis, 2018; Williams et al., 2014). In distance education literature, the focus of many previous studies has been on students' academic integrity (Amrane-Cooper et al., 2022; Ekahitanond, 2014; Hunter & Kier, 2022), unethical behavior, corrupt practices, academic misconduct (Burgason et al., 2019; Malik, 2015; Tsai, 2016) and other related terms. Sharp practices, by definition, are complex behaviors at institutions of learning impacted by several situational, contextual, and individual characteristics that undermine higher education quality worldwide (Starovoytova & Namango, 2016). It is well-documented that most students who graduate with high grades from institutions nowadays do not have abilities equivalent to their measure of academic grades owing to a range of academic wrongdoings (Arop et al., 2018; Bassey et al., 2019). The need for excellent grades and the desire to secure career possibilities following graduation seems to be accountable for students' engagement in different forms of unethical behaviors (Madukwe et al., 2019).

Students' participation in sharp practices has eaten deeply into the credibility of higher and distance education institutions, contributing to the swelling of their error scores (Owan et al., 2023). According to the Classical Test Theory (CTT), a student's true score can be determined using their observed score (actual score) plus or minus an error score. That is, there is always a degree of random or systematic error for every score a student obtains in an examination. These errors can often emanate from the test attributes, respondents' characteristics, environment, mode of examination, and the number of students in the hall, among several other factors. Therefore, students' indulgence in sharp practices increases the error score while decreasing or skewing the true score (Ekechukwu & Nwamadi, 2017; Joshua, 2019). Thus, misleading judgments can be made on the trait measured (Bassey et al., 2020; Bassey & Owan, 2020; Memory & Abosede, 2021; Owan et al., 2023; Owan, 2020) if the error score is not minimized.

In the past, participation in such unacceptable activities impacted students' performance in semester exams, leading to misleading grading and the quality of graduates offered to society by institutions (Bassey et al., 2019; Odigwe et al., 2018; Owan, 2020). Examples of sharp practices widely discussed in the literature are cheating, plagiarism, falsification and deceit (Arop et al., 2018). Others include sabotage, inducement, collaboration with an instructor to extract money from students, collusion, impersonation, and arm-twisting (Kumar, 2008). Aside from exam-related fraud, many students take their classmates' notes, textbooks, calculators, mobile phones, and other academic resources without returning them (Gullifer & Tyson, 2014). Some distance education students also tend to duplicate assignments from their peers for submission to instructors due to intellectual laziness. Some even go great lengths to locate computer business centers where they assume their bright colleagues must have typeset their works to reproduce them with new cover pages for submission covertly. Other scholars have reported that many students' assignment and term paper reports lack in-text citations and adequate referencing (Bachore, 2016; Eneji et al., 2022), which are dubious acts of intellectual theft. All these behaviors are reprehensible and should be addressed immediately.

Many students have blamed their apparent indulgence in academically deceptive practices on specific instructors' unprofessional behaviors. They claim this manifests in the form of certain teachers demanding excessive payments as a prerequisite for passing their exams. Some students attributed their engagement in academic misconduct to poor instructional delivery by lecturers, difficulties identifying quality course materials, and the school administration's inadequate execution of disciplinary procedures. While their justifications may be valid, it remains to be seen what reasons these students will provide in cases where they failed to bribe morally strong and professional instructors (Arop et al., 2018; Madukwe et al., 2019). The fact that many students label good-behaving instructors as "wicked individuals" undermines some of their reasons and suggests to the researchers the necessity to unearth the truth regarding this subject.

Various efforts have been suggested and implemented to address the issue of sharp practices, such as the use of 'higher-ordered' test items (Bassey & Owan, 2020), reinforcing institutional leadership and supervisory strategies (Madukwe et al., 2019; Owan et al., 2022b). Quality assurance committees are now overseeing and enforcing distance institutions' examination policies, as have campaigns to welcome new students and educate them on the importance of avoiding sharp examination practices (Bassey et al., 2019). Additionally, some distance education institutions have banned the idea of having class representatives and adopted the two-week result submission policy (Owan et al., 2023). Furthermore, conference marking strategies have also been used in crossing out and stamping all empty spaces in students' answer booklets before handing them to instructors for scoring (Arop et al., 2018). However, implementing these measures has not reduced the number of students engaging in sharp practices in DEIs. The current research was conceived by the persistence of the problem and the failure of different measures implemented to curb sharp practices.

The present study sought to understand the situation of students' indulgence in sharp practices and uncover some underlying parameters contributing to it. Thus, variables such as class size, instructional delivery and institutional policies were presumed to be explanatory of students' indulgence in sharp practices. Six sharp practices, identified by exploratory factor analysis and in line with existing literature, were considered in this study. These include cheating, plagiarism, falsification, impersonation, arm-twisting, and inducement. The study provided answers to questions such as:

1. To what extent do distance education students in two class sizes differ in their indulgence in sharp practices?

2. How much does instructional delivery predict distance education students' indulgence in the six sharp practices?

3. To what degree do institutional policies predict distance education students' indulgence in the six sharp practices?

4. What is the relationship among the six sharp practices indulged by distance education students?

LITERATURE REVIEW

Previous studies have found that distance education students indulge more in sharp practices whilst taking online assessments than traditional examinations (Lanier, 2006; Shraim, 2019). In a study that surveyed 1,262 students for academic integrity, Lanier (2006) discovered that academic integrity was eroding due to the incident of cheating that was common in online classes compared to the traditional classroom setting. To maintain integrity in distance education, studies have indicated that examinations be substituted with other forms of assessment, adopting different examination forms, using online proctoring solutions and considering compulsory pass and fail grades (Elsalem et al., 2021). The study of Elsalem et al. also indicated that maintaining honesty in assessment requires examination combined with quizzes and submission of a written report. These studies all made suggestions aimed at reducing students' indulgence in sharp practices without testing their workability.

In a meta-analytic review, Giluk and Postlethwaite (2015) discovered that conscientiousness and agreeableness were negatively related to academic dishonesty while on the contrary, neuroticism, extraversion and openness to experience were positively related to academic dishonesty. A study on the role of essential need fulfilment in academic dishonesty showed that undergraduates in the need-frustration condition were more likely to cheat, while the contrary was the case with their counterparts in the need-satisfaction condition (Kanat-Maymon et al., 2015). While these studies offered reasons for students' indulgence in sharp practices, they did not quantify the degree to which students depended on them for unethical practices.

Studies on class size have also attested to its role in the malpractice behaviors of students. For example, Ekanem (2016) indicated that average class size distribution produced negative externalities on students' social well-being and increased delinquent behaviors among them. Nevertheless, the cited study further found that average class size distribution could determine students' well-being in terms of concentration, sadness and anxiety, while it was not significantly dependent on dizziness and disposition for malpractice. On the contrary, Miller and Ronit (2017) showed that classroom size, norms and the severity with which the institute treats dishonesty were the factors that most strongly influenced students' attitudes and behavior. Although the cited studies are related to the present study, their primary focus was not on distance education institutions.

Much research attention has also been paid to teachers' instructional delivery as a predictor of students' unethical engagements. For example, Muchai (2014) showed that several factors that contributed to cheating were contextual factors such as class attendance, lecturer-student interactions, poor invigilation, lack of adequate facilities and poor instructional delivery in the institutions. Xiao and Wilkins (2015) found that lecturer commitment to students' academic achievement and social integration were positively related to students' satisfaction and refusal to indulge in delinquent behaviors. Oko et al. (2017) showed that fear of failure, and congested sitting arrangements in examination halls, among others, are reasons why students associate with examination malpractice in universities. The survey of Petters and Okon (2014) indicated that societal preference for paper qualification, lack of positive self-concept and effective study skills, poor teaching process, inadequate preparation, and laziness are some of the causes of examination malpractice among distance education students. Another study associated distance education students' involvement in dishonest practices with teachers' poor subject proficiency (Fask et al., 2015).

Regarding institutional policies, Adeoti et al. (2015) revealed that the lack of appropriate punitive measures for culprits and peer influence were significant factors responsible for examination malpractices. Abanobi (2017) demonstrated that strict policies on the punishment of defaulters were not followed, which promoted students' indulgence in sharp practices. Saana et al. (2016) revealed that improper enforcement of academic dishonesty policies, high academic load and pressure to please family and guardians were the leading causes

of academic dishonesty in institutions. Cheating during examinations and inappropriately sharing answers in preparing assignments were some of the highly-occurring forms of academic dishonesty. Bachore (2016) disclosed that academic dishonesty was caused by the difficulty of the tests/exams, time scarcity, irrelevance of course material, pressure to get good grades and losing clarity on the policy and the need to have extra points to raise their grades.

METHOD

This study is within the quantitative research method framework, adopting the ex-post facto design. We used this research design based on the notion that the variables of the study had already occurred in DEIs before this investigation. The context of this study is Cross River State, Nigeria, located in the country's South-South geopolitical zone. Latitude 5°45'N and Longitude 8°30'E are the area's coordinates. The state is bounded on the north by Benue State, on the west by Ebonyi and Abia States, on the southwest by Akwa Ibom State, and the east by the Republic of Cameroon. The distance education institutions in Cross River State were studied due to the prevalence of unethical behaviors among distance education students in other contexts (Burgason et al., 2019; Malik et al., 2021; Valizadeh, 2022). Besides, in this study, various forms of sharp practices appear prevalent among distance education learners. These gave rise to the choice of the study's context to compare results with those from other parts of the world.

Participants

The targeted participants for this study comprised 871 respondents randomly drawn from a population of 1,742 final-year distance education students. These respondents were from nine selected departments across the two distance education institutions (National Open University of Nigeria [NOUN], Ikom and Calabar study centers; the National Teachers' Institute [NTI], Calabar) in Cross River State, Nigeria. The participants of this study were 54% males (n = 470) and 46% females (n = 401). The analysis of respondents' age revealed that 13% (n = 113) were less than 20 years, 48% (n = 418) were between 20 and 24years, 32% (n = 279) were between 25 and 29 years, whereas 7% (n = 61) were 30 years or older. Final year students were considered for convenience in gathering data since they have more knowledge and experience about academic integrity than other levels. Final-year students were also considered because they were writing their final research projects and were more likely to violate academic integrity while writing their research projects and term papers.

The multi-stage sampling procedure was employed in selecting the sample for this research: this involved cluster and simple random sampling techniques. Clustering was performed in stage 1 to group final year students according to the two participating institutions. In stage 2, the nine available faculties across both institutions (NOUN = eight faculties; NTI = one faculty) were purposively selected. In stage 3, one department from each selected faculty was randomly enlisted using the simple random sampling technique. All the final year students in the nine selected departments, numbering 871, constituted the sample for this study (representing 50% of the targeted population). A prospective power analysis was performed before data collection using the G*Power program (Cohen, 1988; Erdfelder et al., 2009; Faul et al., 2007) to determine whether the sample size of this study was large enough to achieve sufficient statistical power (Uakarn, 2021). The result of the a priori power analysis indicated that a sample of 152 (For Pearson Correlation), 567 (for simple linear regression) and 148 respondents (for independent t-test) is adequate for the study to achieve 95% statistical power in accurately rejecting the null hypothesis when the alternative hypothesis is true or vice versa. This indicates that the sample of 871 distance education students selected for the study is larger than the minimum requirements for an acceptable power.

Data Collection and Analysis

Measures

This study considered three predictive factors: class size, instructional delivery and institutional policies. Class size is the total number of distance learners in a class. It is the lecturer-student ratio in distance education institutions. Instructional delivery refers to the degree to which lecturers effectively discharge

teaching assignments to students in distance education institutions in line with expected standards. Institutional policies denote the availability and implementation of guiding principles directing distance education students' behavior and how the breach of such rules and regulations will be handled or enforced.

This study examined six sharp practices: cheating, plagiarism, falsification, impersonation, arm-twisting and inducement. Cheating is using unauthorized aids and displaying unethical behavior during an examination. Plagiarism is the use of the intellectual works of others without acknowledging the source(s). Falsification is the alteration of information or data, gaining unauthorized access through hacking or altering computerized records during or after an examination. Impersonation is the act of a person passing off to write an examination for another person. Arm-twisting refers to candidates' or accomplices' actions to strike fear (verbally, physically or otherwise) in officials or the examiner to gain undeserved grades to pass an examination. Inducement is the act of using monies, sex or gift items before or after a test to induce examiners for the awards of undeserved marks.

The Scale

A structured questionnaire was used for data collection in this study. The items on the questionnaire were based on inputs from the review of related literature and contemporary trends of academic integrity in higher education institutions. A new instrument was developed for contextual peculiarities due to a dearth of a previously validated instrument measuring the variables of this study. Section A of the questionnaire requested respondents' biographic information such as sex, institution, and class size. Section B measured instructional delivery and institutional policies, with each variable having five items. *Lecturers pay attention to students' questions while teaching* is a sample item on instructional delivery. *In my institution, there are provisions for punishing all forms of examination malpractices* is a sample item for institutional policies.

Section C contained 24 items that elicited information on the six sharp practices. Each of these was measured with four items. A sample item for arm-twisting is *"some students can gang up to threaten lecturers for high grades after examinations."* A sample item for cheating is *"some intelligent students swap scripts with their dull colleagues during an examination."* For falsification, a sample item is *"some students produce fake school fees receipts if they cannot pay their school fees."* A sample item for impersonation is *"some students upgrade their examination scores through examination officers."* A sample item for inducement is *"some students in my school cannot pass any examination without offering gifts to lecturers."* A sample item for plagiarism is *"most of my colleagues use electronic documents downloaded from the Internet without citing the source."* The questionnaire was designed in a modified 4-point Likert scale format, where respondents were given four options, including Strongly Agree (SA), Agree (A), Disagree (DA) and Strongly Disagree (SD) to choose the one that matches their opinions. The participants were required to respond objectively based on their degree of agreement or disagreement with the attributes measured.

The initial draft of the instrument was submitted to five quality assurance experts and three psychometrists for content and face validity. These experts scrutinised the items and rated their clarity, relevance, and ambiguity. Their ratings were used to quantify the degree of content validity following the Lawshe approach (Lawshe, 1975). Based on the average ratio, item content validity indices ranged from .86 to .98, whereas the scale content validity was .95. These values met the minimum acceptable thresholds (Hadi et al., 2020; Zamanzadeh et al., 2015). However, items observed as ambiguous and irrelevant were dropped and revised accordingly. The instrument was trial-tested on a pilot sample of 200 final-year distance education students who were not the main study's participants but were part of the population. This sample was considered large enough and in the recommended ratio (5:1) of students per item in the questionnaire for a dimension reduction technique to be implemented (See Boateng et al., 2018; Mundfrom et al., 2005). The dimensionality of the questionnaire was determined using exploratory factor analysis (EFA), while construct validity (convergent and discriminant) was also performed.

Ethical Consideration

Before conducting the study, the researchers obtained written permission from each participant. Participants were informed about the study's goals to make an informed decision about whether to participate. Based

on national regulations, ethical clearance was waived for this study since filling out a questionnaire poses no major health risk, and the items in the questionnaire were not self-directed (See Federal Ministry of Health, 2007, pp. 13-14). Participants signed or thumb-printed the informed-consent form before participating in the study. Everyone who took part in the research understood that it was entirely up to them whether they wanted to take part in it and exit at any point. To protect participants' privacy, we did not collect respondents' personal information such as names, emails or phone numbers. This way, participants could be confident that their identities were protected. The data collected were kept secure and private in passworded computer accessible only to the research team.

Procedure for Data Collection/ Analysis

Data for the main study was collected by the researchers who made physical visits to the distance education institutions after obtaining permission to administer the questionnaire. Copies of the questionnaire were distributed to the respondents with the help of three trained research assistants to ensure a high rate of return. The respondents were encouraged to give accurate and unbiased responses to every item with a confidentiality guarantee. The respondents filled and returned the questionnaire copies to the researchers after one week. Of the 871 questionnaires administered, 821 were filled correctly and returned, representing a 94.26% return rate. The 821 copies contained no missing responses and were used for statistical analysis. Independent t-test, regression and Pearson correlation analyses were all used to answer the research questions (where applicable).

FINDINGS

Exploratory Factor Analysis

The Maximum likelihood estimation was used for the EFA, and a KMO value of .72 was obtained, with a significant Bartlett's test of sphericity, $\chi^2(435) = 2645.87$, $p < .001$. This means the pilot sample is adequate for the implementation of EFA. Several irrelevant items were screened out, such as those that loaded on factors with fewer than three items; those with loadings below .30; those that cross-loaded to multiple factors; those with empty loadings. After screening eleven irrelevant items, an 8-factor solution was extracted with eigenvalues greater than one. These eight factors jointly explained 58.43% of the total variance. Relatively, factors 1, 2, 3, 4, 5, 6, 7, and 8 explained 9.03, 9.35, 10.23, 6.77, 6.36, 6.22, 5.43 and 5.05% of the shared variance respectively. The factor and pattern matrices revealed that all factor loads across the eight extractions ranged from .57 to .90. After a careful examination, the factors were named based on the items that loaded onto them. Thus, factors 1, 2, 3, 4, 5, 6, 7, and 8 were labelled instructional delivery, institutional policies, cheating, armed twisting, plagiarism, inducement, impersonation and falsification (See Table 1).

Table 1. Exploratory Factor Analysis of the Questionnaire

Factors	Items	M	SD	λ	λ2	ε
Instructional delivery	1. Most lecturers do not offer constructive feedback to students' questions	2.46	1.16	.90	.81	.19
	2. Differentiated lessons are offered to capture the varied learning needs of students	2.41	1.14	.80	.64	.36
	3. Most lecturers only offer course outlines without teaching us	2.41	1.15	.80	.63	.37
	4. Lecturers always engage students to do additional research to enhance their content knowledge.	2.42	1.15	.79	.63	.37
	Sum	9.70	4.60	.29	2.71	1.29
Institutional policies	5. Involvement in examination malpractice is punishable in my institution	2.45	1.17	.85	.73	.27
	6. Policies on academic misconduct are made available to all students	2.60	1.10	.82	.67	.33
	7. Victims of the same academic crimes face similar sanctions	2.59	1.17	.79	.62	.38
	8. Different offences have clearly stated disciplinary actions for offenders in the school handbook.	2.56	1.13	.78	.60	.40
	Sum	10.20	4.57	3.24	2.62	1.38

Cheating	9. Some of my colleagues utilise lecture notes to write exams	2.37	1.11	.93	.87	.13
	10. Some students enable their friends to duplicate their answers during exams	2.37	1.11	.87	.76	.24
	11. Many students that engage in test misconduct are frequently not discovered	2.41	1.13	.82	.68	.32
	Sum	7.15	3.35	2.62	2.30	.70
Armed-twisting	12. Some students intimidate teachers to achieve good ratings after examinations.	2.56	1.16	.78	.61	.39
	13. When faced with challenging examination problems, many students confront instructors face-to-face.	2.37	1.10	.70	.50	.50
	14. Some students use forceful means to get proposed examination questions before they are written	2.61	1.11	.69	.47	.53
	15. Some students consult influential relatives to get favourable grades from hapless lecturers.	2.54	1.13	.60	.36	.64
	Sum	10.08	4.50	2.77	1.94	2.06
Plagiarism	16. Some students at my institution copy scholarly publications without properly citing their sources.	2.48	1.12	.84	.71	.29
	17. Some students submit homework that has been copied from other classmates.	2.53	1.10	.82	.67	.33
	18. Some of my colleagues' research work has been rejected due to a high 'Turnitin' similarity report	2.46	1.14	.75	.56	.44
	Sum	7.47	3.36	2.41	1.94	1.06
Inducement	19. Several students pay their instructors money to pass an exam in my institution.	2.48	1.09	.82	.67	.33
	20. Some students at my institution provide unsolicited gifts to lecturers to pass exams.	2.47	1.13	.79	.62	.38
	21. Class representatives often collect funds from colleagues to untoward lecturers for high grades.	2.56	1.12	.78	.60	.40
	Sum	7.51	3.34	2.38	1.90	1.10
Impersonation	22. Some students often help their friends write their exams on their behalf	2.57	1.08	.79	.63	.37
	23. Some students hire professional imposters to represent them during examinations	2.52	1.13	.68	.47	.53
	24. Some intelligent students swap scripts with their duller colleagues to assist them after completing theirs	2.52	1.08	.66	.44	.56
	25. Some students do not write their examinations by themselves	2.47	1.08	.57	.33	.67
	Sum	10.08	4.37	2.71	1.86	2.14
Falsification	26. Some students at my school pay to improve their low cumulative grade point average.	2.49	1.06	.70	.49	.51
	27. Some final-year students present research results that were not derived from experiments/field surveys	2.49	1.09	.70	.49	.51
	28. some students get unauthorized access to alter their result records.	2.53	1.12	.69	.48	.52
	29. Some friends use fake receipts for school fees to get into exam rooms.	2.49	1.05	.61	.37	.63
	Sum	10.00	4.32	2.70	1.83	2.17

Extraction Method: Maximum Likelihood.

Rotation Method: Promax with Kaiser Normalization.

a Rotation converged in 5 iterations.

Construct Validity (Convergent and Discriminant) and Reliability

In this study, we followed the Fornell-Larcker criterion (Fornell & Larcker, 1981) to establish the convergent validity of the instrument. This approach uses the Average Variance Extracted (AVE) and Composite Reliability (CR) metrics to determine whether the measurement model has convergent validity. AVE is the difference between

the degree of variance captured by a construct and measurement error. Values over 0.70 are considered extremely excellent, while values of 0.50 are deemed adequate (Owan et al., 2022c). Regarding reliability, CR is a measure of internal consistency and is regarded as a more accurate estimate than Cronbach's alpha. CR values of 0.7 or higher are considered acceptable (Owan et al., 2022a). Mathematically, the AVE for construct ξv is defined as:

$$AVE\xi v = \frac{\sum \lambda_{vk}^2}{(\sum \lambda_{vk}^2) + \varepsilon_{vk}}$$

Where:

$\sum \lambda^2_{vk}$ = Sum of the squared factor loadings for construct ξv with k number of items

$_{vk}$ = Error variance of the Kth (K_1, K_2, K_3, …, K_n) of construct ξv

But, $_{vk} = 1 - \ ^2_{vk}$

Similarly, the composite reliability (CR) for construct ξv is given as:

$$\rho c \xi v = \frac{(\sum \lambda_{vk})^2}{(\sum \lambda_{vk})^2 + \varepsilon_{vk}}$$

Where:

$\sum \lambda_{vk}$ = Sum of the factor loadings for construct ξv with k number of items

$_{vk}$ = Error variance of the Kth (K_1, K_2, K_3, …, K_n) of construct ξv

Discriminant validity was examined using the Fornell-Larcker testing methodology by evaluating how much variation ($AVE\ \xi v$) it captures and how much variance it shares with other constructs (ϕ_{iv}). The a priori is that the values of the square root of the AVE for each construct should be bigger than the inter-construct correlation. That is,

$$\sqrt{AVE\xi v} \geq \phi_{iv}\ \forall_i \neq v$$

Table 2. Convergent and Discriminant Validity Evidence of the Questionnaire

Factors	AVE	α	CR	1	2	3	4	5	6	7	8
1. Instructional delivery	.68	.89	.89	**.82**							
2. Institutional policies	.65	.88	.88	.01	**.81**						
3. Cheating	.77	.91	.91	.02	-.05	**.88**					
4. Armed-twisting	.48	.79	.79	-.02	.07	.17	**.70**				
5. Plagiarism	.65	.77	.84	-.02	-.04	-.16	-.14	**.80**			
6. Inducement	.63	.77	.84	.10	.04	.01	-.05	.01	**.79**		
7. Impersonation	.46	.84	.77	.02	-.15	-.12	.01	.01	.04	**.68**	
8. Falsification	.46	.83	.77	-.04	.22	.09	-.01	.03	-.01	-.17	**.68**

AVE = *Average variance extracted. Values above .50 are evidence of convergent validity*

= Cronbach alpha reliability estimate

CR = Composite reliability estimates

Bolded values along the diagonal are square roots of AVE.

Discriminant validity is achieved once the diagonal values are greater than the correlation estimates off the diagonal.

The convergent and discriminant validities were computed using these formulas. Table 2 shows that convergent validity was achieved for instructional delivery, institutional policies, cheating, plagiarism and inducement because all their AVE values are greater than .50. Although factors such as armed twisting, impersonation, and falsification had AVE values slightly lower than .50, convergent validity was also achieved because their CR values were greater than .60 (Fornell & Larcker, 1981). All the factors had acceptable reliability because their CR values were above the .70 threshold. Table 2 shows that discriminant validity was also achieved since all the bolded values along the diagonal are greater than the correlation values below.

Research Question 1

To what extent do distance education students in two class sizes differ in their indulgence in sharp practices? Distance education students were classified into two independent groups based on their responses to class sizes in section A of the questionnaire. A class size of 1-35 students is small, whereas those with more than 35 students are considered large per Nigeria's National educational blueprint. An independent t-test analysis revealed that 459 respondents were in a small class while 362 were in large classes. On average, Table 3 indicates that distance education students' indulgence in sharp practices such as cheating, armed twisting, plagiarism, impersonation and falsification was more prevalent in large than small class sizes. Only inducement was observed to be higher in small than large classes. Furthermore, Table 3 revealed significant mean differences between small and large class sizes in distance education students' indulgence in sharp practices such as cheating, plagiarism, impersonation, and falsification. No significant class size mean difference was recorded for distance education students' indulgence in sharp practices such as arm-twisting and inducement.

Table 3. Independent T-Test Result of Class Size Differences in Distance Education Students' Indulgence in Six Sharp Practices

Sharp practices	Class size	N	M	SD	MD	t	p
Cheating	Small	459	15.1	3.8	1.24***	4.85	.000
	Large	362	16.4	3.4			
Plagiarism	Small	459	15.1	3.8	1.16***	4.54	.000
	Large	362	16.3	3.4			
Impersonation	Small	459	14.7	4.6	2.27***	7.87	.000
	Large	362	17.0	3.5			
Falsification	Small	459	14.8	3.9	0.62*	2.25	.025
	Large	362	15.4	3.9			
Arm-twisting	Small	459	13.2	4.5	0.53	1.60	.110
	Large	362	13.8	4.9			
Inducement	Small	459	15.0	4.6	0.50	1.54	.124
	Large	362	14.5	4.8			

***Significant at p < .001

*Significant at p < .05

df = 819; M = Mean; SD = Standard deviation; MD = Mean difference

Research Question 2

How much does instructional delivery predict distance education students' indulgence in the six sharp practices? A simple linear regression analysis was performed to predict students' indulgence in the six sharp practices based on instructional delivery. Table 4 shows that 2, 4, 2, 2, 2 and 2% of the variance in

distance education students' indulgence in sharp practices such as cheating, armed twisting, plagiarism, inducement, impersonation and falsification is explained by instructional delivery. Thus, 98, 96, 98, 98, 98 and 98% of the unexplained variances are attributable to other extraneous predictors. Table 4 also shows that instructional delivery predicts distance education students' indulgence in all six sharp practices. This is because the F-ratios of the various sharp practices had significant p-values at 1 and 819 degrees of freedom. The significant negative prediction of the results in Table 4 implies that other things being equal, a 1% increase in instructional delivery is associated with a 0.15, 0.17, 0.14, 0.15, 0.13, and 0.14% decline in distance education students' indulgence in cheating, armed-twisting, plagiarism, inducement, impersonation and falsification, respectively.

Table 4. Prediction of distance education students' indulgence in sharp practices using instructional delivery

Sharp practices	Model	SS	MS	F	R²	
Cheating	Regression	234.01	234.01	17.47***	.02	-.15
	Residual	10970.54	13.40			
	Total	11204.56				
Arm-twisting	Regression	212.46	212.46	15.57***	.04	-.17
	Residual	14923.25	18.01			
	Total	15035.72				
Plagiarism	Regression	257.87	257.87	19.65***	.02	-.14
	Residual	10750.27	13.13			
	Total	11008.14				
Inducement	Regression	244.24	244.24	18.75***	.02	-.15
	Residual	10550.27	13.53			
	Total	11008.14				
Impersonation	Regression	258.44	258.44	14.50***	.02	-.13
	Residual	14593.35	17.82			
	Total	14851.80				
Falsification	Regression	241.16	241.16	18.37***	.02	-.14
	Residual	10613.38	13.10			
	Total	12637.53				

***Significant at p < .001

SS = Sum of squares; MS = Mean square

df = 1 & 819

Research Question 3

To what extent do institutional policies predict distance education students' indulgence in the six sharp practices? Table 5 indicates that institutional policies explain 1.0, 1.0, 0.0, 4.0, 0.0 and 0.0% of the variance in distance education students' indulgence in cheating, arm-twisting, plagiarism, inducement, impersonation and falsification. This implies that 99, 99, 100, 96, 100 and 100% of the unaccounted portions of the variances are attributable to other predictors, respectively. Furthermore, Table 5 shows that institutional policies significantly predict distance education students' indulgence in cheating, arm-twisting and inducement. However, institutional policies do not predict substantially distance education students' indulgence in sharp practices such as plagiarism, impersonation and falsification. If other things remain the same, Table 5 indicates that a 1% increase in the formulation of a sound university policy is tied to 0.08, 0.10 and 0.20% reductions in distance education students' indulgence in sharp practices such as cheating, arm-twisting and inducement respectively.

Table 5. Prediction of distance education students' indulgence in sharp practices based on university policy

Sharp practices	Model	SS	MS	F	R2	β
Cheating	Regression	70.55	70.55	5.19*	.01	-.08
	Residual	11134.01	13.60			
	Total	11204.56				
Arm-twisting	Regression	179.34	179.34	8.23**	.01	-.10
	Residual	17856.38	21.80			
	Total	18035.72				
Plagiarism	Regression	27.31	27.31	2.04	.00	-.05
	Residual	10980.83	13.41			
	Total	11008.14				
Inducement	Regression	680.99	680.99	32.54***	.04	-.20
	Residual	17140.75	20.93			
	Total	17821.74				
Impersonation	Regression	35.10	35.10	1.94	.00	-.05
	Residual	14816.70	18.09			
	Total	14851.80				
Falsification	Regression	0.28	0.28	0.02	.00	-.01
	Residual	12637.25	15.43			
	Total	12637.53				

***Significant at p < .001

**Significant at p < .01

*Significant at p < .05

Df = 1 & 819s

Research Question 4

What is the relationship among the six sharp practices indulged by distance education students? Table 6 shows that cheating has a weak significant positive relationship with plagiarism, falsification, arm-twisting and inducement, respectively. However, cheating has a moderately significant positive correlation with impersonation. Plagiarism was found to have a weak positive but significant relationship with falsification, impersonation, arm-twisting and inducement. Similarly, falsification has a significantly weak and positive correlation with impersonation, arm-twisting and inducement, respectively. Furthermore, impersonation correlates with arm-twisting and inducement in a weak, positive and significant manner. Lastly, there is a weak, significant, positive relationship between arm-twisting and inducement.

Table 6. Correlation matrix of the relationship among the six sharp practices indulgence by distance education students

Sharp practices	M	SD	(1)	(2)	(3)	(4)	(5)	(6)
(1) Cheating	15.7	3.7	1	.15***	.19***	.48***	.25***	.08*
(2) Plagiarism	15.6	3.7	.000	1	.13***	.14***	.15***	.12**
(3) Falsification	15.1	3.9	.000	.000	1	.13***	.20***	.15***
(4) Impersonation	15.7	4.3	.000	.000	.000	1	.14***	-.02
(5) Arm-twisting	13.5	4.7	.000	.000	.000	.000	1	.22***
(6) Inducement	14.7	4.7	.032	.001	.000	.644	.000	1

M = Mean; SD = Standard deviation

Values above the diagonal are bivariate Pearson correlation values

Values below the diagonal are probability levels

*** p < .001   ** p < .01   * p < .05

DISCUSSIONS AND CONCLUSION

Discussion

The first finding of this study discovered that sharp practices such as cheating, plagiarism, falsification, impersonation, and arm-twisting were more prevalent in large class sizes than in smaller ones among distance education students. Only inducement was higher in small classes than in large ones. This finding may be due to the crowded nature of large classes, where many students may go unnoticed in implementing unacceptable practices. Also, because students sit compactly in large class sizes, it may be difficult for light to penetrate; thus, making the spaces underneath desks dark for an invigilator to sight from a distance small piece of papers (usually held by some students during examination). On the contrary, in small class sizes, sharp practices such as impersonation will be reduced since lecturers may be able to recognize almost all the students in the class. Class size may not have influenced distance education students' indulgence in falsification, arm-twisting and inducement because these are usually done in secret and on a personal or small group basis.

This finding aligns with Ekanem's (2016) finding that average class size distribution produced negative externalities on the university students' social well-being and increased delinquent behaviors among them. The finding also agrees with the results of Miller and Ronit (2017) that the best predictors of attitudes and behaviors are situational factors (i.e., the characteristics of the student's academic environment). This finding in the present study implies that a teacher may be more effective in instructional delivery in small than large classes and that when a teacher is effective in the classroom, students learn better and thus help them prepare effectively before the examination. This simply connotes that smaller class sizes may increase learning effectiveness and reduce sharp practices among university students.

This study uncovered secondly that instructional delivery is a significant negative predictor of students' indulgence in sharp practices in distance education institutions. This implies that, other things being equal, an increment in the quality of instructional delivery is associated with a decrease in students' indulgence in sharp practices and vice versa. This finding is not surprising because lecturers can communicate the correct values for distance learners to shape their behaviors through the instructional delivery process. Lecturers can also inform students of the dangers of indulging in sharp practices. Such advice may go a long way to minimize the degree to which distance education students are involved in sharp practices. Conversely, institutions where lecturers do not instruct students against these, may witness a high rate of students' indulgence in sharp academic practices.

This finding corroborates the result of Muchai (2014) that several factors that contributed to cheating were contextual such as class attendance, lecturer-student interactions, poor invigilation, lack of adequate facilities and poor instructional delivery in the institutions. This also agrees with the study of Xiao and Wilkins (2015) that lecturer commitment to students' academic achievement and social integration were positively related to student satisfaction and refusal to indulge in delinquent behavior. The implication of this to learning effectiveness is that successful learning typically requires effective performance from students and lecturers. Lecturers committed to their student's academic achievement will spend more time and effort planning lessons, developing and acquiring learning resources, researching new content, and thinking about how to convey information and monitor student progress for effective learning. This may also be a practical model to ensure that students learn effectively and shun all forms of academic misconduct.

Thirdly, this research revealed that institutional policies significantly predicted students' indulgence in sharp practices such as cheating, arm-twisting and inducement in distance education institutions. However, institutional policies had a non-significant negative prediction of distance education students' indulgence in falsification, plagiarism, and impersonation. The inverse prediction recorded for the six sharp practices implies that well-formulated and implemented policies in distance education institutions could be used to reduce students' indulgence in cheating, arm-twisting, plagiarism, inducement, falsification and impersonation. This is because well-documented policies will specify clear rules and regulations stating what is expected, what should be avoided, and the punishment for going against the laws. Implementing such policies may prevent students from involving in sharp practices, while the punishment that will be meted out to offenders may serve further as a deterrent to other students.

The non-significant effect of institutional policies on students' indulgence in plagiarism, falsification and impersonation is attributable to the poor implementation of policies that address the three identified practices.

For example, it is rare to find many students being penalized for plagiarizing other people's work. Also, the punishment allocated for impersonation (imprisonment) appears too strict for most distance education institutions to implement. Consequently, students caught impersonating are rarely reported to relevant committees and authorities for action. The reluctance of lecturers to report such cases and institutions' unwillingness to take disciplinary sanctions on students caught indulging in such sharp practices could enable students to continue in such fraudulent acts, being aware that nothing would be done. Falsification may not have responded significantly to the prediction of institutional policies because such are usually challenging to detect, and where students are caught, they are rarely handed over to disciplinary committees for action. This finding supports Archibong (2012), whose study showed that many students and lecturers are not punished for their wrongdoings; hence, the mere formulation of university policies did not improve students' indulgence in sharp practices. Therefore, until appropriate policies are correctly enforced, distance education institutions will find it challenging to curb the trend of sharp practices among students.

Lastly, this study found significant positive correlations among students' indulgence in almost all the six sharp practices, except for the correlation between impersonation and inducement. This result suggests that distance education students who cheat during examinations, plagiarize other people's work, arm-twist for private gains, falsify records, induce lecturers for grades, and promote impersonation are more likely to carry out all other forms of sharp practices. The only exception is that students who induce lecturers (using different strategies) are not likely to impersonate and vice versa. This result is explainable because inducement and impersonation often improve scores after an examination. A person who had planned for impersonation may not find any reason to induce lecturers for increased marks, having already hired a more brilliant person for the examination. People may resort to inducement if they are sure of not writing an examination very well. Therefore, a student can resort to inducement if impersonation plans fail but may remain calm if successful.

Conclusion

This study was designed to quantify the degree of students' indulgence in six sharp practices in the context of some distance education institutions in Nigeria. The study proved that some institutional variables promoted, whereas others discouraged, sharp practices among distance education students. Variables such as large class sizes, inadequate instructional delivery, and deficiently implemented institutional policies promoted students' indulgence in sharp practices. Conversely, small class sizes, good instructional delivery, and well-implemented university policies can discourage sharp practices among distance education students. Thus, the extent of students' indulgence in sharp practices will vary with a distance education institution, depending on the class size, quality of instructional delivery, and the implementation of formulated policies. This study implies that future acts of sharp practices depend on the way they are managed in the present day. This has further implications on the need for urgent attention to be paid to grey areas (such as the need to enforce policies, punish offenders and formulate implementable policies) to address the shortcomings in distance education institutions. The study also proved that students' indulgence in one form of sharp practice is connected to their indulgence in other sharp practices. This study has contributed to the distance education literature by providing evidence of the predictive parameters of students' indulgence in sharp practices. The study has also opened up some grey areas where distance education institutions can focus to promote ethical behaviors among students. Based on the study's conclusion, it is recommended that:

i. Distance education institutions in Nigeria reduce enrollment figures during admission processes to a level that guarantees a lecturer-student ratio of 1:35. More facilities, infrastructures, and personnel should be recruited where prominent enrollment figures are recorded to reduce class sizes and properly monitor students' behaviors.

ii. During lesson delivery, lecturers should ensure that they communicate the benefit of hard work and the dangers of students' engaging in sharp practices. This will help in sensitizing students on the correct values to adopt and the ones to shun.

iii. All policies to guide students' behavior should be enforced with all amounts of rigor. Guidelines should be developed on the discipline administered to any offender of particular offences. This will help minimize incidences of academic fraud. Enforceable policies should be formulated, and the discipline of erring students should be publicly communicated to serve as a deterrent to others.

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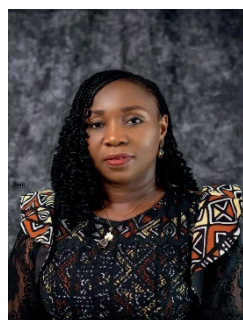
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BLENDED LEARNING IN HIGHER EDUCATION: A BIBLIOMETRIC ANALYSIS

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ABSTRACT

This research aims to analyze the past literature on blended learning in higher education and investigate the research trends on this subject. Thus, it aims to present a roadmap for future studies. In this context, bibliometric and descriptive analysis methods were used in the study carried out with the descriptive survey model. 1970 studies were accessed using the Web of Science (WoS) database to reach the data within the scope of the research. As a result of the filtering process on the database, the distribution of the relevant publications by year, document type, publication language, country and WoS indexes, the most influential institutions and research, cooperation between institutions and countries, the most cited authors, and the most studied topics were reviewed. According to the research results, the studies on blended learning in higher education were primarily published in the form of articles in English between the years 2002-2021. It is also deduced that Spain stands out, especially in producing publications, and these studies are generally published in the Conference Proceedings Citation Index - Social Science & Humanities (CPCI-SSH) index type. The most active journal with high citation density is Computers & Education, and the country that collaborates most is England. Regarding the keywords used in the articles, while the concepts of online learning, higher education, and student participation are prominent in the studies conducted in the first years, the concepts such as flipped classrooms, Edmodo, sustainability, gamification, mobile learning, and emotions came to the fore in the following years. In this context, discussions were conducted within the framework of the literature, and suggestions were made related to the findings obtained.

Keywords: Blended learning, bibliometric analyses, higher education, bibliometric mapping.

INTRODUCTION

The transformation and development processes of learning and teaching processes continue in online environments in line with the needs of the age. It is a fact that changing technologies and applications in online learning environments make the education process more dynamic. This fact highlights the necessity of teachers to understand the changing needs of students under these conditions and use appropriate teaching methods (Alharthi & Zhang, 2021; Azizan, 2010; Duman, 2023; Gambo & Shakir, 2022; Hartono & Ozturk, 2022). Thus, learner-centered online teaching methods have diversified, and different learning practices have been developed.

With the increase in online learning applications, the accessibility of learning content has led to the emergence of different models in learning environments. Instructors use blended learning as one of these models through different applications (Bates, 2015). These applications are carried out by sending online assignments to support teaching in the classroom environment or carrying the course content to the classroom environment with a technological presentation or video tool. However, blended learning is used in different ways, some of which are conducted in the online environment, while others are conducted in the classroom environment with traditional methods. In this context, blended learning offers the potential to benefit from the advantages of online and traditional learning environments. Providing the right blending in the pedagogical, technological, and social context in the use of blended learning methods in different environments results in increased functionality and flexibility (Bozkurt & Sharma, 2021). This can be interpreted as the fact that blended learning requires the responsibility of developing blended strategies in the conduct of teaching methods and activities, as well as providing flexibility in the choice of environment.

The need for flexibility of students in higher education the effort of teaching staff to use teaching methods appropriate to the diversity of learners (Boelens et al., 2018) are among the reasons why blended learning models are used. Besides, this type of learning is preferred in terms of its potential to provide learning experiences to learners in various environments and its positive effect on learner performance and achievement (Graham et al., 2005; Ndibalema, 2021; Vo et al., 2020). Especially in higher education, learning models and applications blended with the prolongation of the COVID-19 epidemic process is in high demand. Realizing the potential of blended learning in higher education requires further studies of applications and the development of teaching staff in this regard, and a holistic understanding of these studies. In this sense, this research aims to examine the studies conducted in the field of blended learning with a current approach from a broad perspective using the bibliometric analysis method.

LITERATURE

Blended Learning

Blended learning is one of the fundamental innovative methods that emerged due to the increase in online learning experiences and the use of current technologies in classroom environments. It comes with varied definitions in the literature (Abass et al., 2021; Alammary et al., 2014; Dankers et al., 2022; Faridah et al., 2022; Gault & Cuevas, 2022; Hrastinski, 2019; Osguthorpe & Graham, 2003). One of the most common definitions was made by Graham (2006): "Blended learning systems combine face-to-face instruction with computer-mediated instruction" (p. 5). According to Rossett (2002), blended learning uses more than one education method together to increase the teaching quality. According to another definition, it is the use of different education methods in a traditional learning environment as well as the technologies used (Singh, 2003). The overall consideration of the definitions suggests the basic components of blended learning are face-to-face and online education. However, despite the existing definitions, some researchers argue that there is uncertainty regarding the term blended learning (Driscoll, 2002; Oliver & Trigwell, 2005).

Blended learning is the combination of face-to-face and online teaching through a deliberate design that serves the purpose of supporting learning (Assylzhanova et al., 2022; Boelens et al., 2015; Drysdale et al., 2013; Nurhayati et al., 2021; Ojaleye & Awofala, 2018; Seage & Turegun, 2020; Thompson & McDowell, 2019). This unification takes place through the blending of learning environments, online learning tools, and presentation methods (Bonk & Graham, 2012). Blended learning can also be regarded as an educational approach that bonds various models of traditional and distance education and makes use of all kinds of technology.
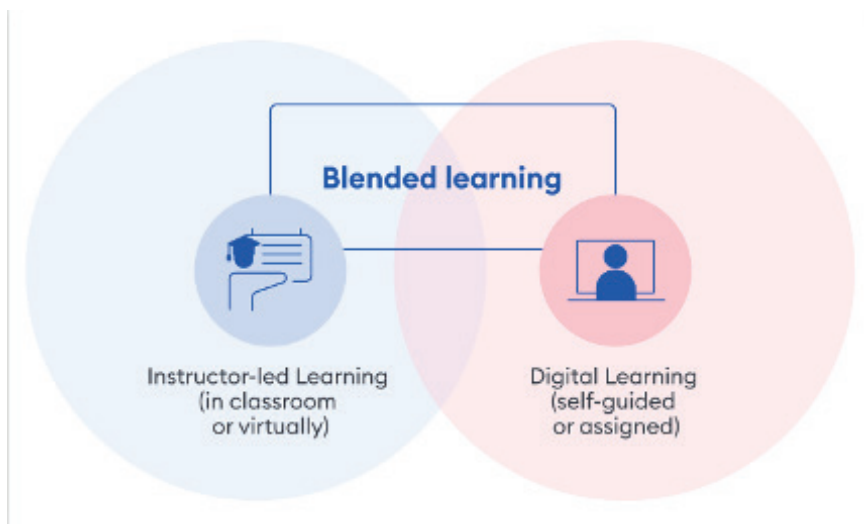
Figure 1. Blended learning (Kokoulina, 2021)

During the blending process, 30% to 79% of the course content is presented online (Allen et al., 2007). In this context, blended learning aims to support the quality of learning by carrying the advantages of face-to-face and online environments into learning processes.

Blended Learning Models

There are different applications in the design process of blended learning content presented in various environments, in what order and how, depending on the teaching purposes (Bryan & Volchenkova, 2016). This situation brings certain classification efforts and highlights blended learning models. Table 1 presents the classification methods for blended learning models.

Table 1. Classification Forms of Blended Learning Models

Valiathan	Rossett & Frazee	Horn & Staker	Staker & Horn	Hannon & Macken
2002	2006	2011	2012	2014
Skill driven model	Anchor blend	Face-to-face driver	Rotation model - Station-Rotation model - Lab-Rotation model - Flipped-Classroom model - Individual-Rotation model	Blended presentation and interaction
Attitude driven model	Booked Blend Model	Online Laboratory Model	Flex model	Blended block mode
Competency driven model	Field Blend	Rotation model	Self-Blend model	Predominantly online
		Flex model	Enriched virtual model	
		Self-Blend model		
		Online driver model		

Valiathan (2002) discusses blended learning models in three groups.

1. Skill-driven model
2. Attitude-driven model
3. Competency-driven model

Through these models, this learning method aims to help learners acquire skills suitable for their pace, change behavior and attitude, and learn through interaction (by observing an expert at work). For these purposes, online and face-to-face activities are used. The model proposed by Rossett and Frazee (2006), on the other hand, is mainly focused on the programs that offer training for competence. This model includes classroom activities enriched with workplace experience and online learning.

Horn and Staker (2011) first discussed blended learning with six different classifications. Their very recent study removed the face-to-face learning and online laboratory categories and rearranged the classification to accommodate diversity (Staker & Horn, 2012). Thus, the following models emerged.

1. In the *flex model*, learning content is basically offered online. Thus, in a customized and adaptable program, the student can deliver homework and content in any environment.

2. In the *self-blend model*, some courses are taken entirely online to complement face-to-face teacher-taught lessons.

3. In *rotation* models, education takes place in a face-to-face school, while lessons are supported by online content and activities. These models include enriched learning, online activity, and face-to-face activities.

In the models proposed by Hannon and Macken (2014), the use of face-to-face activities consisting of individual and group activities together with online work and collaborative activities is significant. The consideration of the classification types of blended learning models indicates that the understanding of blending in course design changes by the purpose and pedagogy of learning, teaching mode, and environments.

Benefits and Challenges of Blended Learning

Although the blended use of online and face-to-face learning activities in the blended learning process looks simple and easy, effective blended learning is only possible with the design of learning experiences and their suitability for the process (Garrison & Kanuka, 2004; Garrison & Vaughan, 2013; Ghimire, 2022; Mursid et al., 2022; Namyssova et al., 2019). The advantages and disadvantages of a blended learning process designed in this way are shown in Table 2.

Table 2. The Benefits and Challenges of the Blended Learning

Benefits	(Singh & Reed, 2001; Osguthorpe & Graham 2003; Esfandiari, 2005; Posner, 2005; Wilson & Smilanich, 2005; Oh & Park, 2009)	- Time and cost-efficient - Ease of access to the course and course content, - Individual and active learning - Communication skills - Effective and easy teaching applications, - Supporting individual differences such as learning speed, - Flexibility - Positive results on achievement, motivation interaction, and feedback.
Challenges	(Arabasz & Baker, 2003; Koohang et al., 2006)	- The necessity of providing time, education, and resource qualifications for the integration of activities and course contents in accordance with blended learning, - Internet speed bandwidth problems, - High costs, - Problems caused by software and hardware.

Although blended learning has uncertainties in terms of costs and outcomes (Horn & Staker, 2011), research shows that blended learning contributes positively to learning performance (Graham et al., 2005; Hebebci & Usta, 2015). In the lessons in which the blended learning method is used, the continuous availability of content and materials, allocating more time to activities, the use of social networks, interaction, and participation rates are the factors that increase learner achievement (Bozkurt, 2018; Francis & Shannon,

2013; Means et al., 2009). Nevertheless, one of the factors that prevent the positive outcome of the blended learning process is that the content for learners includes the obligation to use, and the preferences for the presentation of the content are not taken into account (Ash, 2012). Nevertheless, the quality blended learning process is expected to be sensitive to the individual learners' needs. Additionally, integrating the potential of technological tools with the instructors' skills for meaningful learning experiences in digital transformation processes is among the meaningful expectations (Azizan, 2010; Bruggeman et al., 2021; Kir, 2020). In addition to this integration, which is valid for the course environment, studies show that blended learning needs institutional transition strategies to be implemented (Graham et al., 2013). In this context, it requires institutional decision-makers to develop strategies, instructors to develop digital skills, and learners to participate in the process by accessing content and resources.

Significance of the Research

Studies on blended learning mostly focus on learners' perspectives and experiences, and the number of studies on academic applications is limited (Torrisi-Steel & Drew, 2013). The literature review reflects an urgent need to define blended learning and understand its applications. However, the changing structure of both learners and learning environments and the experiences in online learning during the COVID-19 epidemic boldly underlines the use of the blended learning model, and such cases show that the tendency of preferring this model in the future is high (Becker et al., 2017; Bozkurt et al., 2020; Pelletier et al., 2021). Besides, the increasing interest in this subject in higher education and the announcement of many universities that they have switched to the blended learning model also reveals the necessity of examining the studies on the subject.

When the literature is examined, it is seen that there is a limited number of studies examining blended learning tendencies in higher education. What distinguishes this study from other bibliometric analysis studies on blended learning (Brown, 2015; Omar et al., 2021; Raman et al., 2021; Yang et al., 2017) is that it focuses on higher education and is based on Clarivate Analytics' Web of Science Core Collection (WoS) data. Considering the year 2020 and after, when the importance of distance education is felt intensely, the bibliometric research prepared in this context should be increased in terms of quality and quantity. In addition, these studies are of great importance in terms of identifying gaps in the literature, contributing to the literature, and guiding future research.

Objective of the Research

The objective of this research is to determine the trend of publications on blended learning in higher education in various perspectives to systematically identify the increasing interest in blended learning in recent years. In this context, answers to the following research questions were sought.

Research Questions

1. What is the distribution of publications on blended learning by year, document type, publication language, country, and WoS indexes?
2. What are the most influential (most-cited) resources, institutions, and researches in the field of blended learning?
3. What kind of cooperation exists between institutions and countries in the field of blended learning?
4. What kind of relationship is there between the most cited authors in the field of blended learning?
5. What is the relationship between the most studied topics in the field of blended learning?

METHOD

This research aims to examine the trends of blended learning studies in higher education by designing in descriptive survey model. In this context, bibliometric and descriptive analysis methods were used to analyze academic studies in blended learning.

Bibliometric analysis, a type of analysis that evaluates the development, scientific quality, impact of studies, and resources on any subject, has recently been used by researchers in different fields frequently (Okhovati & Arshadi, 2021; Hebebci, 2021; Hebebci & Alan, 2021; Kushairi & Ahmi, 2021; Miskiewicz, 2020). Although bibliometric analysis studies cannot replace literature reviews, they have a crucial complementary factor (Talan, 2021). In the descriptive analysis approach, the data obtained are summarized and interpreted according to the previously determined themes (Yildirim & *Simsek*, 2011). There are two main purposes in bibliometric research: performance analysis and scientific mapping (Cobo et al., 2011; Gutierrez-Salcedo et al., 2018). While performance analysis expresses the scientific publication performance of institutions, authors, and countries, scientific mapping reveals the dynamics and structure of the scientific field through visualization methods (Cobo et al., 2011; Tang et al., 2018).

Data Collection

WoS, Scopus, Google Scholar, PubMed, and MEDLINE databases are among the most prominent in the international context. The literature also suggests that bibliometric studies are generally based on international indexes such as WoS and Scopus. The data of this research was provided through WoS. This index includes bibliometric data on the most comprehensive publications in the sciences, social sciences, and humanities (Aghaei-Chadegani et al., 2013).

The data collection process was carried out through the detailed search tab on WoS with research-oriented keywords. In this context, the criteria used in the filtering process to obtain the documents are shown in Table 3.

Table 3. Search Strategies

Topic	TS=(("blended learn*" or "blended teach*" or "hybrid learn*" or "hybrid teach*" or "blended edu*" or "hybrid edu*") and ("higher edu*"))
Documents Type	Article, Proceedings Papers, Book, Book Chapter, Early Access, Review, Book Review, Editorial Material
Time Span	All years
Indexes	SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI

As a result of the last inquiry, 1970 studies were evaluated within the scope of research (October 2021). As a result of the query, some bibliographic data of these publications (publication years, publication types, publication languages, titles, author names, authors' countries, institutions, number of citations, abstract, keywords, and references) were obtained. No restrictions were made regarding the year, document type, WoS index, and publication language. The roadmap for the research process is shown in Figure 2.
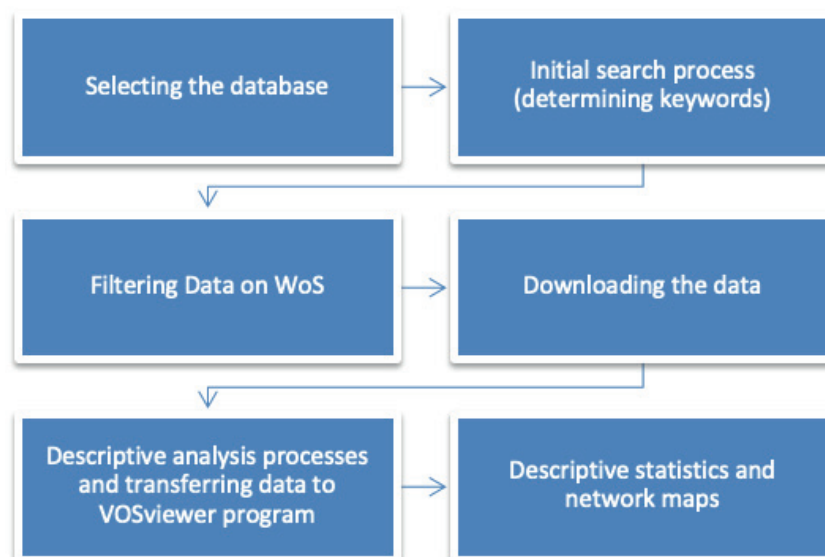
Figure 2. Research Process

Data Analysis

This study used bibliometric and descriptive analysis methods in the data analysis process. The descriptive analysis method was used to analyze the articles based on year, country, journal, and publication language. With regards to the bibliometric analysis, citation analyzes (journal, article, country), co-authorship analyses (countries), co-occurrence analyses (author keywords), and co-citation analyzes (journal) techniques were used.

WoS's analysis system and Microsoft Office software were used during the descriptive analysis processes. Publication year, publication type, WoS category/index, research area, country, and language items were analyzed in this context. VOSviewer 1.6.16 package software was used for bibliometric analysis and visualization. Van Eck and Waltman (2013) developed this free software in Java programming language (see www.vosviewer.com) to visualize and explore maps based on network data. The analysis of the 1970 studies was based on the full calculation method (Van Eck & Waltman, 2010).

FINDINGS

Descriptive Findings

Distribution of Publications by Year

In this study, firstly, the distribution of studies published in the WoS database by year was examined. The obtained results are shown in Figure 3.
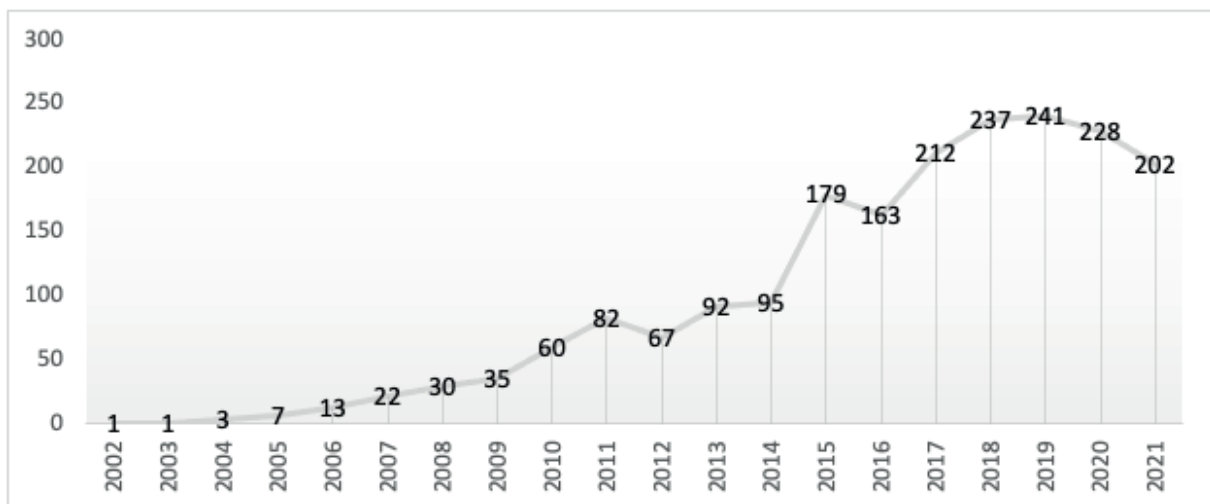
Figure 3. Distribution of Publications by Year

Figure 3 indicates that studies on blended learning in higher education were mainly conducted between 2002 and 2020. The studies generally tend to increase in number. However, it is notable that there is a decline between 2011-2012, 2015-2016, and 2019-2020. It is not possible to make a definite comment about the number of studies in 2021 since it is the year this research was conducted. However, considering the COVID-19 epidemic period, it is thought that studies in this direction will increase even more during the normalization process. Besides, the number of studies on this field has been relatively high since 2016.

Distribution of Publications by Document Type and Language

The distribution of the publications considered within the scope of the research by document type is given in Table 4.

Table 4. Distribution of Publications by Document Type

Document Type	f	%
Article	986	50
Full-text paper	939	47.6
Book chapter	56	2.8
Early access	50	2.5
Compilation	37	1.8
Others (Book, letter, etc.)	16	0.8

Table 4 points out that the studies on the subject in the WoS database are published by different document types. It is noteworthy that most of the studies (approximately 97%) examined between 2002 and 2021 were articles and full-text papers. This finding shows that academic journals and conferences on this research topic are pretty active and productive.

The distribution of publications by language is shown in Figure 4.
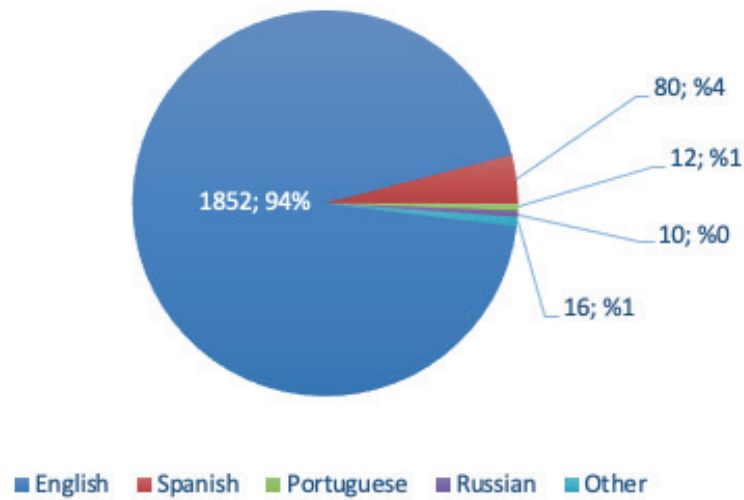
Figure 4. Distribution of Publications by Language

Examining the studies by written language shows that English (f=1852; 94%) is well ahead, followed by Spanish (n=80; 4%), Portuguese (n=12; 1%) and other languages (n=26; 1%).

Distribution of Publications by Country

The distribution of the publications on the research subject by country was examined. All countries with at least one publication were included in the review. The top 10 countries with the most publications are shown in Figure 5.
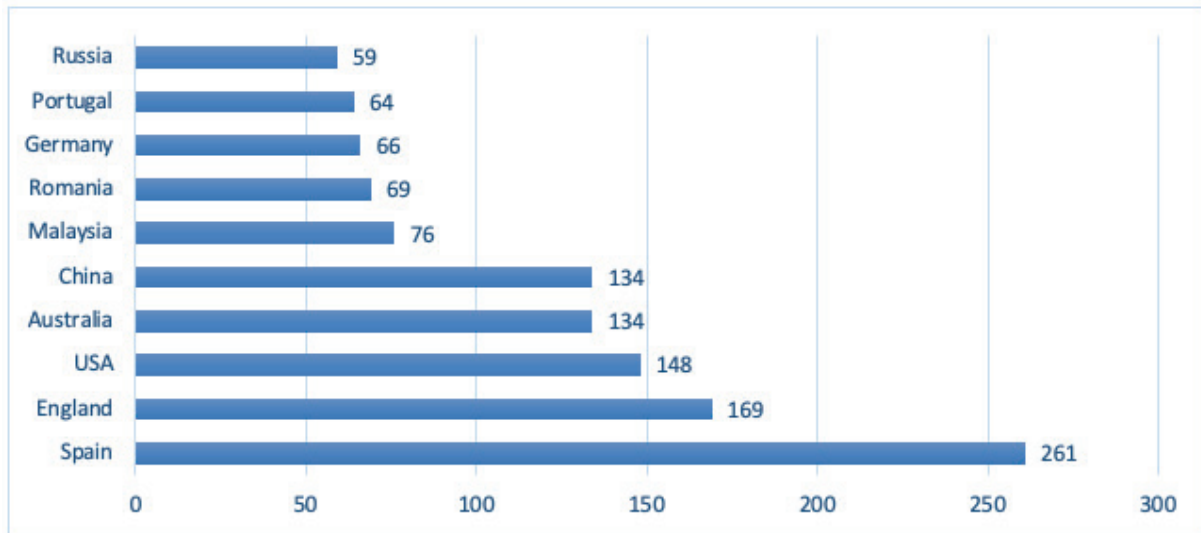
Figure 5. Distribution of Publications by Country

The distribution of publications by country demonstrates that Spain is first with 261 publications, followed by England with 169 publications, and the USA with 148 publications. Besides, Australia (n=134), China (n=134), Malaysia (n=76), and other countries are the ones that succeed the first three.

Distribution of Publications by WoS Indexes

The distribution of the publications within the scope of the research by WoS indexes is shown in Figure 6.
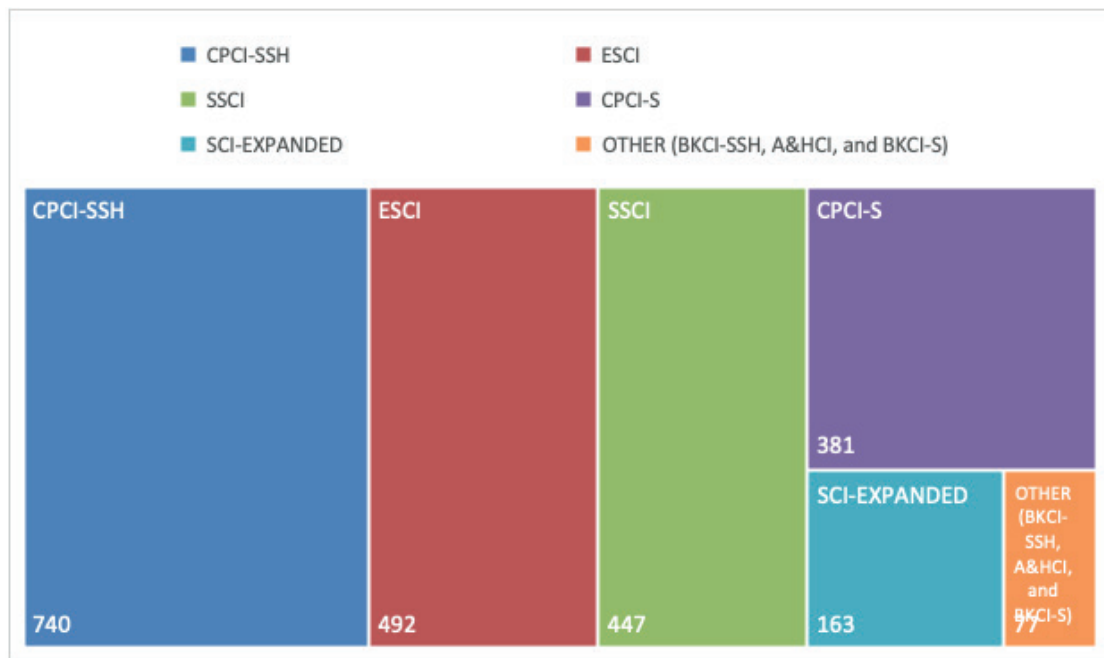
Figure 6. Distribution of Publications by WoS Indexes

Figure 6 shows that Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH) has the highest number of publications with 740 based on the WoS indexes, followed by Emerging Sources Citation Index (ESCI) with 492 publications, Social Sciences Citation Index (SSCI) with 447 publications, and Conference Proceedings Citation Index – Science (CPCI-S) with 381 publications.

Citation Analysis (Research, Institution, and Source)

Citation analysis enables the most cited works, authors, countries, or sources to be revealed. In this type of analysis, citations are used as an impact measure (Zupic & Cater, 2015).

Most Cited Studies

Within the scope of the research, the 10 most cited studies in the literature and their details are shown in Table 5.

Table 5. Top 10 Most Cited Studies

Title of the study	Author(s)	Year	Source	Number of citations
Online formative assessment in higher education: A review of the literature	Gikandi et al.	2011	Computers & Education	358
The Effectiveness of Online and Blended Learning: A Meta-Analysis of the Empirical Literature	Means et al.	2013	Teachers college record	305
Blended learning in higher education: Students' perceptions and their relation to outcomes	Lopez-Perez, M. V., Perez-Lopez, M. C., & Rodriguez-Ariza, L.	2011	Computers & Education	300
A framework for institutional adoption and implementation of blended learning in higher education	Graham, C. R., Woodfield, W., & Harrison, J. B.	2013	The Internet and Higher Education	210
A meta-analysis of blended learning and technology use in higher education: from the general to the applied	Bernard, R. M., Borokhovski, E., Schmid, R. F., Tamim, R. M., & Abrami, P. C.	2014	Journal of Computing in Higher Education	185
Blended learning in higher education: Institutional adoption and implementation	Porter, W. W., Graham, C. R., Spring, K. A., & Welch, K. R.	2014	Computers & Education	172
Sustainability in higher education in the context of the UN DESD: a review of learning and institutionalization processes	Wals	168	Journal of Cleaner Production	168
The impact of a flipped classroom design on learning performance in higher education: Looking for the best "blend" of lectures and guiding questions with feedback	Thai, N. T. T., De Wever, B., & Valcke, M.	2017	Computers & Education	153
Student perceptions and achievement in a university blended learning strategic initiative	Owston, R., York, D., & Murtha, S.	2013	The Internet and Higher Education	148
Personalising learning: Exploring student and teacher perceptions about flexible learning and assessment in a flipped university course	Wanner, T., & Palmer, E.	2015	Computers & Education	144

Table 5 gives information about the authors of the most cited studies on WoS, the year of publication, the source, and the number of citations. In this context, the most cited study is Gikandi et al. (2011) with 358 citations, followed by Means et al. (2013) with 305 citations, Lopez-Perez et al. (2011) with 300 citations, and Graham et al. (2013) with 210 citations.

Distribution of Most Cited Institutions

The results of the citation analysis regarding the institutions of the researchers who published the publications are shown in Table 6.

Table 6. Top 10 Most Cited Institutions

Institution	Country	Number of Publications	Number of Citations	Connection Strength	Citations Per Publication
Brigham Young University	USA	9	716	391	79.5
University of Canterbury	New Zealand	3	361	43	120.3
Pwani University College	Kenya	1	358	41	358
University of Granada	Spain	13	328	28	25.2
Ghent University	Belgium	8	289	62	36.1
The University of Adelaide	Australia	2	267	44	133.5
Deakin University	Australia	14	239	71	17
Vrije University Brussel	Belgium	17	204	129	12
Zayed University	UAE	3	198	128	66
Concordia University	Canada	2	198	119	99

Table 6 shows that "Brigham Young University" (n=716) is far ahead in terms of the number of citations. This institution is followed by "The University of Canterbury" (n=361), "Pwani University College" (n=358), and "The University of Granada" (n=328). It is notable that "The University of Adelaide" (n=133.3) and "The University of Canterbury" (n=120.3) are leading in the number of citations per publication. The table also reflects that the institutions in the top 10 are mainly located in different countries.

In terms of the number of publications of the institutions, it was revealed that the University of Salamanca (n=18), Vrije University Brussel (n=17), and the University of Malaya (n=15) have a large number of studies.

Distribution of Publications by Source

For the research objectives, sources (journal, full-text book) were examined in terms of the number of publications, the number of citations, the strength of connection, and the number of citations per research. In this context, the 10 most cited sources are shown in Table 7. Total link strength shows the total strength of an item's links with other items (Van Eck & Waltman, 2013).

Table 7. Top 10 Most Cited Sources

Source	Number of Publications	Number of Citations	Connection Strength	Citations Per Publication
Computers & Education	18	1687	206	93.7
Internet and Higher Education	21	1157	297	55
British Journal of Educational Technology	16	443	80	27.6
Australasian Journal of Educational Technology	14	352	80	25.1
Teachers College Record	1	305	0	305
International Journal of Educational Technology in Higher Education	15	292	41	19.4
Computers in Human Behavior	7	279	30	39.8
Journal of Computer Assisted Learning	8	267	29	33.3
Higher Education Research & Development	23	236	69	10.2
Journal of Computing in Higher Education	8	232	81	29

In terms of the journals examined regarding the number of citations, "Computers & Education" (n=1687) and "Internet and Higher Education" (n=1157) are far ahead of other journals.

When the number of citations per publication is analyzed, "Teachers College Record" is ahead with 305 citations. However, this journal has only one article on the relevant subject. When this journal is excluded from the scope, it is noteworthy that the journals titled "Computers & Education" (n=93.7), "Internet and Higher Education" (n=55), and "Computers in Human Behavior" (n=39.8) lead.

Table 7 expresses that all 10 most cited sources are international journals. Although there are similar numbers of full-text papers (n=939) and articles (n=986), it is remarkable that the number of citations of journals is higher.

Co-Authorship Analysis (Institution and Country)

Co-authorship analysis provides an overall picture of the authors, institutions, or countries that are linked in the authorship share of academic work. Co-authorship of technical research refers to the involvement of two or more authors or organizations (Newman, 2004).

Co-Authorship Analysis for Institutions

The co-authorship relations of the authors through their institutions were analyzed with regard to the research context. In the bibliometric analysis carried out in this context, "Co-authorship" was chosen as the analysis type and "Institutions" as the unit. Institutions with at least 3 academic studies on the research subject were included in the analysis process. In the analysis, the connections of the institutions and the total connection strength were calculated. The circle size is proportional to the number of publications, while the thickness of the lines is proportional to the frequency of cooperation and connection strength. The institutions related to each other as a result of the co-authorship analysis are shown in Figure 7.
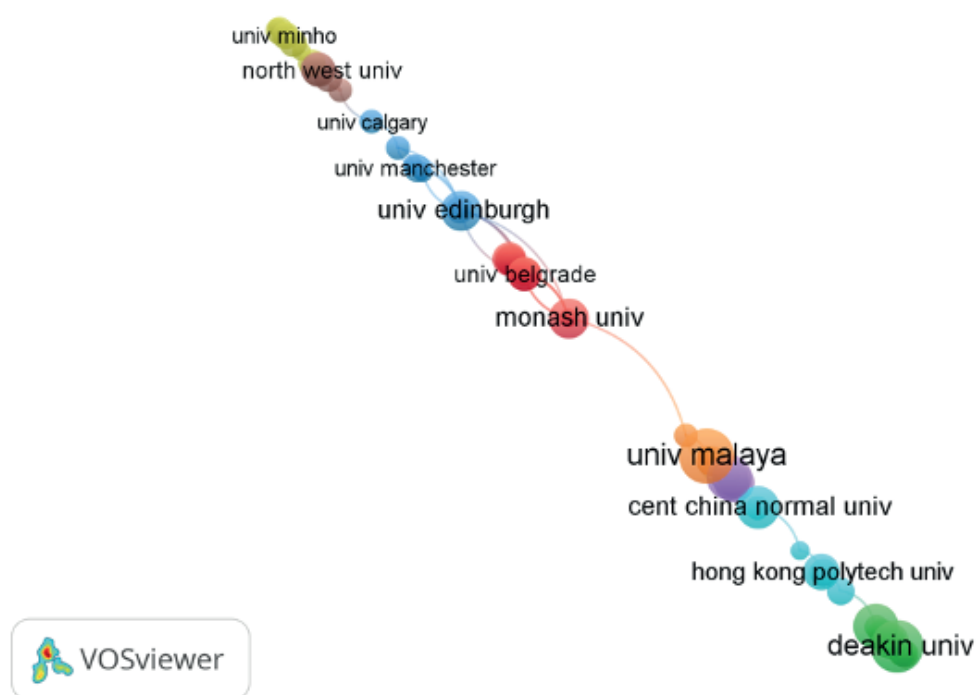
Figure 7. Co-Authorship Analysis for Institutions

As a result of the co-authorship analysis, the most collaborating institutions were found to be the University of Edinburgh (n=12), Pontificia Universidad Catolica de Chile (n=8), Monash University (n=8), and Paul Sabatier University (n=7).

Co-Authorship Analysis for Countries

Within the research scope, the authors' co-authorship relations over their countries were examined. In the analysis performed in this context, "Co-authorship" was chosen as the analysis type, and "Countries" was chosen as the unit. Institutions with at least 1 academic study on the research subject were included in the analysis process. The density map of the institutions that are related to each other as a result of the co-authorship analysis is shown in Figure 8.

When the countries of the co-authors are examined, it is seen that England co-authors with 32 countries, the USA with 26 countries, Spain with 25 countries, Malaysia with 21 countries, Germany with 20 countries, Australia with 20 countries, and France with 18 countries. When evaluated in terms of connection strength, there is a high connection strength between the USA and Spain (n=8), Spain and Chile (n=7), China and the USA (n=6), and England and Scotland (n=5).
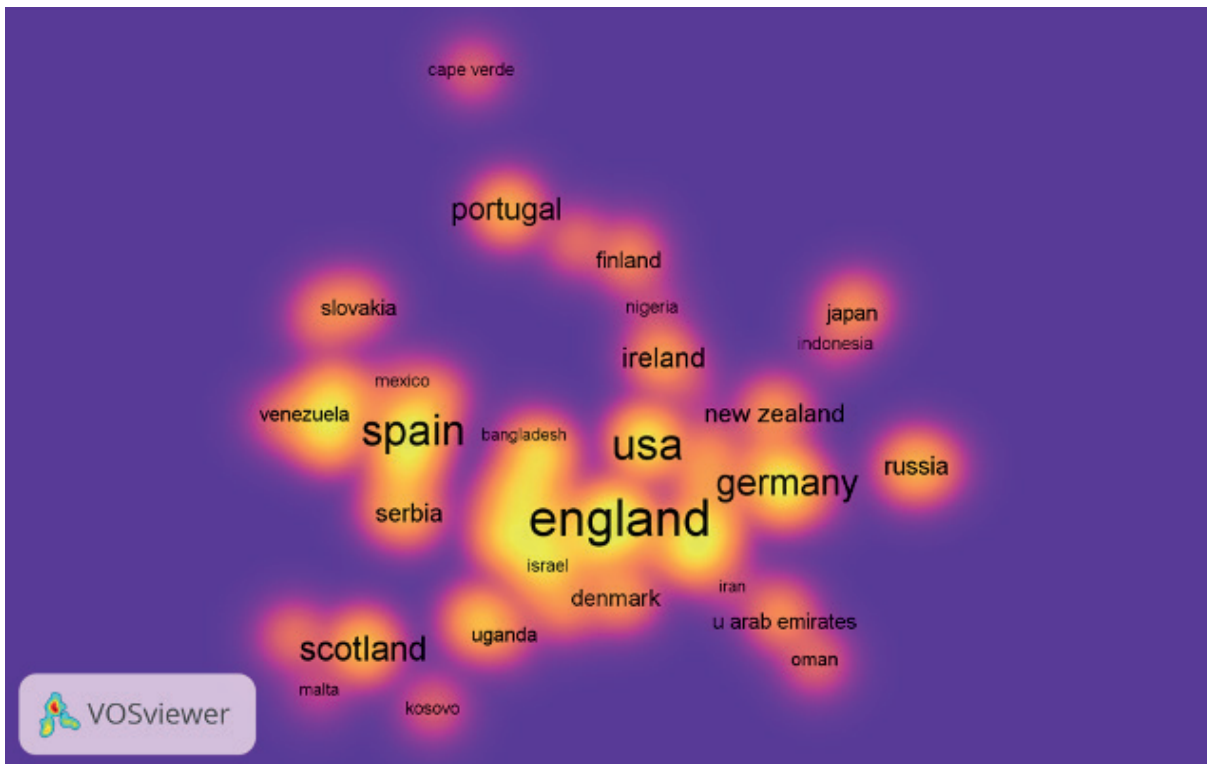
Figure 8. Co-Authorship Analysis for Countries

Co-Citation Analysis (Author)

Co-citation analysis is based on quantifying the relationship between co-cited studies, assuming that more frequently, co-cited studies exhibit greater co-citation strength (Small, 1973). Hence, this analysis was performed to reveal the most cited authors. For analysis, "Co-citation" was chosen as the analysis type, and "cited authors" was selected as the unit. Authors with at least 10 citations on the subject were included in the analysis process. The network structure showing the co-citation analyzes of the publications is shown in Figure 9.
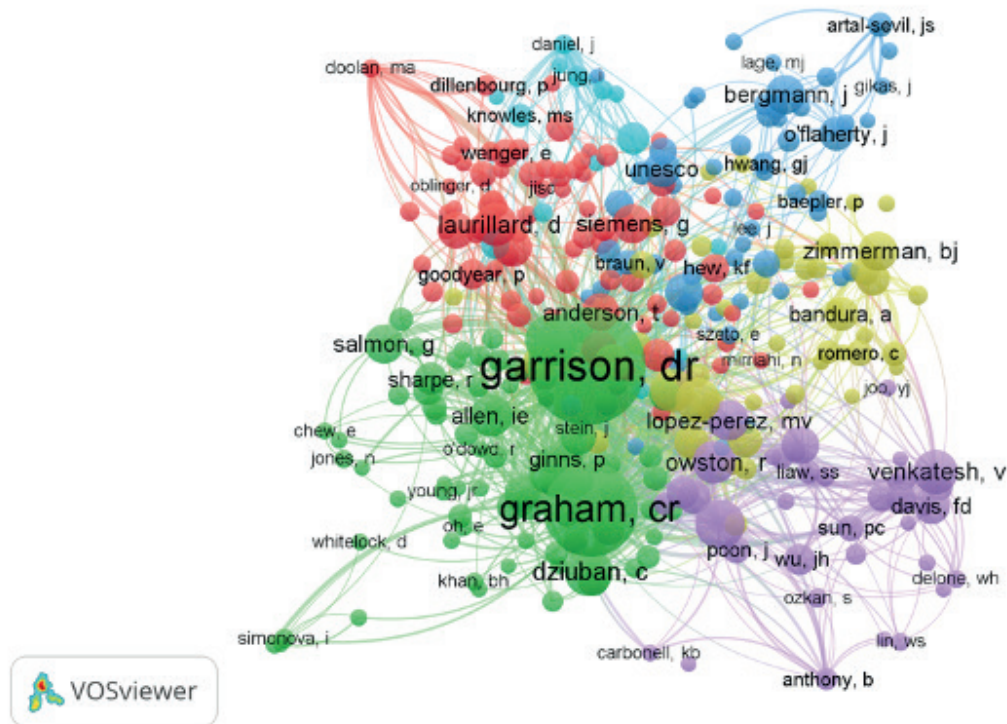
Figure 9. Co-Citation Analysis of Authors

Figure 9 indicates that the authors are categorized under different clusters. Elements that are close to each other form clusters. Large circles reflect that cited publications dominate the others. The circles in the center of the clusters indicate that it is quoted from different areas and has more detailed links to other clusters. Garrison, D. R. (578), Graham, C. R. (385), Bonk, C. J. (131), Porter, W. W. (117), and Dziuban, C. (111) are the most cited authors with more links to other clusters.

Co-Occurrence Analysis

Thanks to the co-occurrence analysis, the strength of the relationship between the words is determined, and the general trends towards a specific field are revealed (Ozturk, 2021). This analysis was carried out to analyze the most used keywords within the scope of the research. In this context, "co-occurrence" was chosen as the analysis type, and "Author keywords" were chosen as the unit. Among the 3552 terms used in the keywords section of 1700 documents obtained from the analysis, 402 keywords that were repeated at least 3 times were identified. The network structure for the relationships between keywords is shown in Figure 10. The size of the circles in the image represents the frequency of using the keywords, and the color of the circles represents the publication years of the studies in which the words were used.
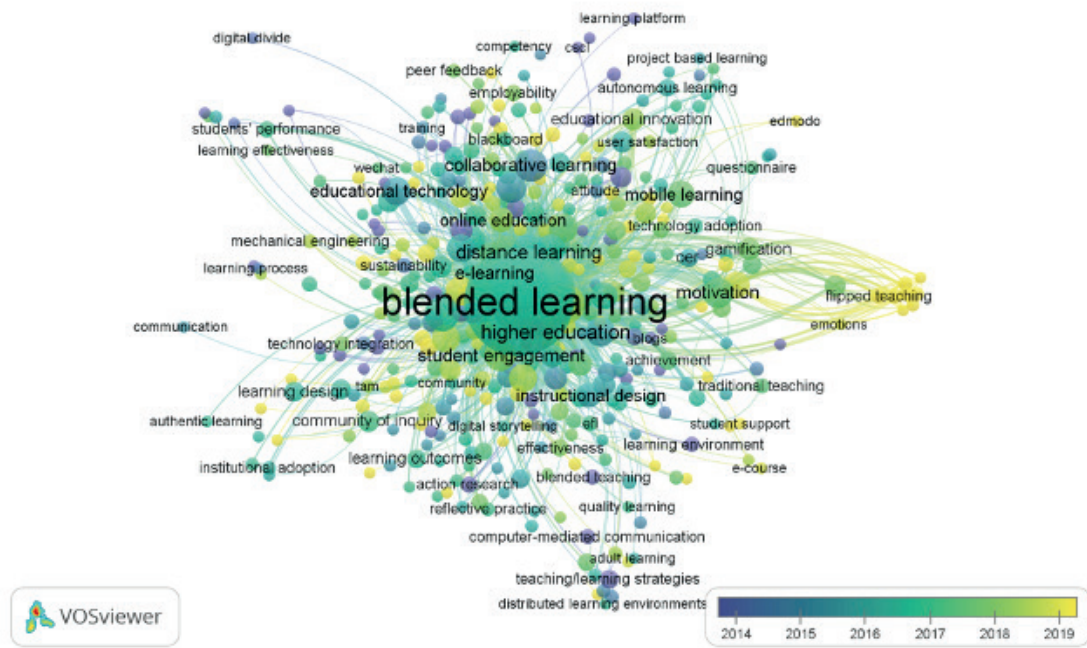
Figure 10. Layer Map of the Most Used Terms in Keywords

Figure 10 demonstrates the layer visualization results in which the most used keywords are hierarchically categorized on the basis of publication year criteria. The figure also reflects that the concepts of blended learning, higher education, and e-learning are frequently used. While it was seen that standard concepts were preferred between 2016 and 2018, it is notable that after 2019, current topics such as flipped teaching, COVID-19, flipped classroom, e-course, and machine learning were introduced.

DISCUSSIONS

The research findings deduce that the number of studies on blended learning in higher education generally increased between 2002 and 2020. This trend was high between 2016-2019, and the number of studies, especially between 2018-2020, rose to prominence. This result is consistent with the study's findings that blended learning practices increased in developed countries between 2018 and 2020 (Anthony et al., 2020). The phases of staying home with the COVID-19 process have resulted in distance education becoming a global norm in 2020 (Williamson et al., 2020). Bibliometric analyses of studies in distance education also show that the number of studies conducted in 2020 has increased (Das, 2021; Sweileh, 2021; Yavuz et al., 2021). In this context, the pandemic has been influential in increasing distance education research trends in different education fields compared to other learning models in 2020. The "Horizon Report" project (Pelletier et al., 2021), which presents the trends in the use of technology in learning and teaching processes, states that the new emerging trend in educational institutions is blended learning. The impact of political and environmental factors is experienced in the increase in research on blended learning (Hu & Song, 2020). This case can be interpreted as the field created by the compulsory use of distance education has left its place in the normalization processes to blended learning practices.

The results of the analysis of the publications by the document type point out that the articles stand out in the studies on blended learning, followed by full-text paper studies. To this end, similar studies are supporting this result in the literature (Arifin, 2021; Omar et al., 2021). The examination of publications in terms of language suggests that English is dominant, followed by Spanish. It is an expected outcome that English is so dominant. Other bibliometric analysis findings also support this result (Omar et al., 2021; Raman et al., 2021). As a matter of fact, the researchers preferred English as the publication language for the widespread effect in their articles. The fact that Spanish is ahead of other languages can be explained by the fact that most of the publications are of Spanish origin.

The distribution of publications by country shows that Spain is the most productive country with 261 publications. This situation can be interpreted as Spain, which is among the top five countries in other surveying studies in the field of blended learning (Castro-Rodriguez, 2021; Raman et al., 2021), tends to come forward in blended learning studies in higher education compared to other countries. It is inferred that the database with the most publications by the WoS indexes of the publications is Conference Proceedings Citation Index – Social Science & Humanities. Besides, the CPCI database, which comes first in the field of social sciences, is one of the most used indexes (Lu et al., 2020).

The journal that stands out in terms of the number of citations regarding blended learning studies is "Computers & Education" (94 citations per publication). As a well-established academic journal dating back to the first years of computer use in the field of education, "Computers & Education" has much valuable content and research community on educational technology (Chen et al., 2020; Zawacki Richter & Latchem, 2018). According to the findings obtained in the study, it is seen that the "Computers & Education" journal maintains its prestige and is a primary resource that is also referenced in blended learning studies.

Brigham Young University is prominent in the citation analysis of the institutions of researchers working in the field of blended learning. The university is an influential institution among the universities of the most cited researchers and the number of publications per institution from the field of blended learning (Castro-Rodriguez et al., 2021; Raman et al., 2021).

Among the studies, the most cited one is Gikandi et al. (2011), with 358 citations titled "Online formative assessment in higher education: A review of the literature." Especially the subject of assessment comes to the fore in the field of online learning (Chen et al., 2020). This situation can be interpreted in the context of the importance of assessment and evaluation in educational research and the importance of formative assessment in online learning environments. In this context, the subject of assessment is one of the most popular topics in the field of blended learning.

According to the findings of the co-author analysis, it is understood that England leads the distribution of co-authors in the field of blended learning in terms of countries and "The University of Edinburgh" in the distribution of institutions. This can be explained in the context of England's investment in academic cooperation within and outside the institution in higher education. In addition to supporting research skills, collaborative academic studies are significant in targeting joint development rather than individual competitive understanding (Tynan & Garbett, 2007). In this regard, the University of Edinburgh stands out as a university that supports cooperation in terms of strategy and institutional policies and aims to realize entrepreneurial and academic cooperation in many fields (Guerrero et al., 2015; Macdonald & Martinez-Uribe, 2010). Collaborations by field experts result in an increase in the number of publications (Sweileh, 2021). It can be argued that the investments made in this context have resulted in efficiency both in the number of publications and in collaborative studies. However, this approach of the university is also reflected in blended learning research among many research areas.

According to the findings of the co-citation analysis, Garrison stands out with 587 co-citations. The author has different studies that provide the basic framework for the use of blended learning in higher education and distance education systems. In addition to these studies, the author is one of the leading researchers who revealed the research community model (2000) and that his studies on questioning communities and cognitive presence in blended learning increase the citation potential.

Technological systems are also social systems (Fuchs et al., 2010). To this end, a good understanding is required to use these systems in learning environments. Especially in systems such as blended learning that require skillful use of technical and pedagogical skills related to both distance education and face-to-face teaching, the functions of flexibility and supporting social and individual differences are remarkable. The keywords used in blended learning research tend towards these specific functions. Especially in the studies conducted in the first years, concepts such as online learning, higher education, student participation, success, and collaborative learning stand out, while in the following years, concepts such as flipped classrooms, Edmodo, sustainability, gamification, mobile learning, and emotions are given more importance. The development of mobile technologies can explain this with their function supporting ubiquitous learning and taking into account personalized features such as sustainability and emotion. In this context, it is possible to assert that research on blended learning in higher education is affected by technological and social developments.

CONCLUSIONS

Blended learning distinguishes itself in terms of its potential for personalized learning in online environments. Blended learning in higher education requires technology and digital skills, as well as face-to-face teaching skills. This case, especially in the process of COVID-19, has made distance education compulsory, and blended learning applications have been experienced as one of the most important alternatives in the pandemic process. It is essential to use the space provided by these experiences to increase the quality of teaching practices, especially after the pandemic. In this matter, the need to determine the framework, trends, prominent studies, and institutions regarding higher education in blended learning arises. In this study, which was conducted in this direction, bibliometric and descriptive analysis methods were used to analyze academic studies in the field of blended learning in higher education between 2002 and 2021. As a result of the analyses, the prominent researches, researchers, institutions, and countries in blended learning research in higher education were identified and analyzed.

Suggestions

In line with the results obtained from the research findings and the information obtained from the literature, some suggestions are presented below for researchers planning to work with a bibliometric perspective in the field of blended learning:

- This study was based on the WoS database. A more comprehensive study can be conducted by including data from important databases such as Scopus and ERIC (Education Resources Information Center).
- Data can be compared using different analysis techniques (Meta-analysis, thematic analysis etc.).
- More detailed results can be obtained by examining more specific areas.
- This research includes studies in higher education. In other studies, different education levels can be investigated.
- Personalized learning experiences on blended learning and pedagogy and technology-oriented studies for the use of new technologies can be carried out for researchers.
- Support should be given to the instructors, and transition strategies should be created to increase the institutions' knowledge and skills related to blended learning.
- Considering the year 2020 and after, when the importance of distance education becomes more evident, the research to be prepared in this context can be increased in terms of quality and quantity.
- Bibliometric analyses covering different time periods can be made. For example, studies after COVID-19 can be examined.
- The VOSviewer program was used for data analysis in this study. Different programs can be used in other studies.

Limitations

This research has some limitations. These limitations can be listed as follows:

- The publications examined in this study were obtained from the WoS database due to the coexistence of qualified peer-reviewed journals. Therefore, the obtained publications were obtained only from a specific database.
- The VOSviewer program, which can work in harmony with WoS database, has an open source structure and can evaluate a lot of data together, was used in the research.
- Research data include studies before October 2021.
- The data is limited to the query sentence made in the topic field on the advanced search page: TS=(("blended learn*" or "blended teach*" or "hybrid learn*" or "hybrid teach*" or "blended edu*" or "hybrid edu*") and ("higher edu*"))

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PROFESSIONAL LEARNING NETWORK ACTIVITIES OF INDONESIAN TEACHERS: DIFFERENTIAL ITEM FUNCTIONING ANALYSIS OF TEACHERS' BACKGROUNDS

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ABSTRACT

Teachers' professional development was gradually shifting to the learning paradigm. Developing a professional learning network (PLN) using social media platforms was one method of teachers' learning. Therefore, this research aimed to investigate the level and differences of activity of teachers when engaged in social media-based PLN using a non-experimental quantitative design. A total of 504 teachers were sampled, and data were collected using PLN Activities Questionnaire (TPLNAQ). Furthermore, the Winsteps application was used to perform the Rasch model analysis. The findings indicated that all teachers sampled had a moderate level of social media-based PLN activities. The demographic factor of qualifications significantly differed between teachers who joined the social media-based PLN. However, some instrument items showed significant differences in responses to the demographic factors of the teachers sampled, namely gender, age, teaching experience, qualifications, and certification.

INTRODUCTION

Professional learning is believed to impact teachers, students, and schools. These positive impacts include a sense of professionalism, commitment to teaching, attitudes toward continuing professional learning, teaching practices, stimulating school change, and improvement in the process and outcomes of student learning (Anderson et al., 2019; Cole, 2012). Yurkofsky et al. showed that teachers who acquire knowledge and skills through professional learning could drive change in their practice and engagement with the outside world (Yurkofsky et al., 2019). Meanwhile, access to broader professional learning helped introduce teachers to new ideas to improve their practice. The implemented learning outcomes are practiced, instilling teachers with confidence and promoting them to approach their profession in novel ways. Along with the development of existing technology, professional learning has shifted toward technological facilities. One popular platform is the use of social media such as Facebook, Twitter, WeChat, Edmodo, Google+, LinkedIn, Edweb, and Schoology, which empirically show a positive impact on various aspects of professionalism and competence (Bommel et al., 2018; Bommel & Liljekvist, 2016; Carpenter & Krutka, 2015; Colwell & Hutchison, 2018; Doak, 2018; Goodyear et al., 2019; Keles, 2018; Nagle, 2018; Prestridge, 2018; Trust et al., 2016; Xue et al., 2019).

A sense of accomplishment in selected career may be fostered by using social media in fields where change occurs rapidly (Mohammed & Kinyo, 2020), such as teaching. Social media is used to build learning networks that focus on teachers' professional development. Social networking sites in the context of professional learning network (PLN) provide opportunities to be active, engage in professional development, and informally manage themselves. PLN is practical and collaborative, promotes independence in developing competencies, and decreases isolation in professional development due to various limitations (Flanigan, 2011; Liljekvist et al., 2017; Trust, 2012). The research by Jones and Dexter showed that interest in PLN is noticeable with the advent of social media in recent years and increased participation in social networking sites such as YouTube, Twitter, and Facebook. This is conducted through involvement in professional learning sites, online video sharing sites, social bookmarking sites, Twitter, podcasts, blogs, and wikis (Jones & Dexter, 2014). In this case, networks can function as a means of expression and communication by professionals, and education has been applied by many teachers' communities (Coutinho & Lisbôa, 2013). Previously, PLN have been conducted using social media. These research explored the social media platform approach for professional learning from the factors of use, forms of activity, and teachers' results (Bissessar, 2014; Bommel et al., 2018; Brown, 2020; Bruguera et al., 2019; Doak, 2018; Goodyear et al., 2019; King, 2017; McLoughlin, 2016; Mostafa, 2020; Nochumson, 2018; Parsons et al., 2019; Trust & Prestridge, 2021).

In the context of PLN using social media platforms, several research showed that it is a potential tool to support professional learning (Patahuddin & Logan, 2019; E. Sari et al., 2012a; E. Sari & Lim, 2012a, 2012b; E. R. Sari, 2012; Sumaryanta et al., 2019). For example, Facebook can provide opportunities to communicate and connect with other educators, allowing relatively easy access to skills, practices, and ways of thinking (Patahuddin & Logan, 2019; E. Sari et al., 2012b). Another research was conducted by Sari & Lim, which specifically explored the complexity of the socio-cultural and contextual aspects through a survey of the Online Learning Community for Teacher Professional Development in Indonesia. Hofstede's cultural dimensions, which consist of the power distance index (PDI), individualism (IDV), uncertainty avoidance (UAI), and masculinity (MAS), were used as a tool for the analysis (E. Sari & Lim, 2012a). Sumaryanta et al. researched professional learning in a community-based teachers' training model and investigated the results after the implementation in Indonesia (Sumaryanta et al., 2019). The results showed that community-based teachers' training had transformed development strategies, which has succeeded in increasing pedagogical and professional competence, motivating individuals to be involved in continuous learning efforts by building a strong network.

As rapidly as information technology and social media infiltrate teachers' life on a vast scale, there is an emergence of informal networks of teachers whose primary focus is professional growth. Social media platforms build learning communities, gather community members, as well as interact and mobilize them in learning activities. Facebook, Instagram, Telegram, WhatsApp, and teleconference applications (Zoom, Webex, Google Meet) are familiar social media. However, no research specifically investigated teacher-learning community members' level of experience or activity. The disposition of the program designer to pay attention to demographic factors can be a determining factor for teachers' participation, hence, the results of teachers' professional development programs can be successful (Loucks-Horsley et al., 2010; Saka, 2013). Another research suggested that in making decisions about professional development programs, two crucial issues require further research, namely the aspects of learning and the effect of teachers' characteristics (Copur-Gencturk & Thacker, 2021). Therefore, it is essential to investigate teachers' level of experience or activity when engaged in social media-based PLN and the demographic factors. The investigation is required to comprehensively understand teachers' activities in the learning community that carries out the process. This research will deepen the focus on how social media-based PLN is used to develop competence and professionalism in teaching. The analysis explores how teachers carry out activities based on the elements in PLN seen from some of their demographic factors.

Based on the background, the following research questions were investigated 1) What was the level of teacher's activities when engaged in social media-based PLN? 2) Are there differences in the level based on their demographic factors? and 3) What teachers' activities differ in the social media-based PLN based on their demographic factors?

THEORETICAL FRAMEWORK

Professional Learning Network

Continuous and quality teachers' professional development becomes an essential and strategic issue in creating high-quality learning (Fraser et al., 2007; Guskey, 2002; Leal Filho et al., 2018; Scott, 2010). Generally, the development programs should be continuously offered to learn and become aware of the main points and principles of professional competence. These include alternatives to develop competence in their teaching practice (Stranovska et al., 2017). The development areas are lesson preparation and planning, teaching and learning, assessment and evaluation, professional development, communication, counselling, classroom management, as well as project and time management to improve the quality of education and teachers' performance (Goksoy, 2018).

Several research showed that teachers' professional development will promote improvement in teaching quality, the achievement of learning objectives, improvement of student learning processes and outcomes, as well as improvement in the effectiveness of schools and educational reforms (Akiba & Liang, 2016; Brooks & Gibson, 2012; Gibson & Brooks, 2013; Helleve, 2010; OECD, 2019; Ozdemir, 2013; Thacker, 2017; UNESCO, 2016). Hamre et al. showed that high-quality professional development programs could improve pedagogical quality (Egert et al., 2020). Furthermore, participation in professional development activities positively relates to teachers' teaching practices in the classroom. Even though the learning practice elements have a tiny effect on expected student performance, participation in professional learning or development activities can make a difference (Fischer et al., 2018). In this era, every teacher is required to develop, achieve different and better results, and be willing to continue learning to achieve self-development as a reaction to their needs and pedagogical reflections. Therefore, professional development gradually shifts to professional learning (Easton, 2008; Grimmett, 2014).

PLN is defined as "a system of interpersonal connections and resources that support informal learning" (Trust, 2012, p. 133). It offers a new space where teachers can learn and grow as professionals with the support of various networks of individuals and resources. With the latest advances in technology and broad access to the internet, teachers can expand their network of connections beyond face-to-face networks, seek emotional help and support, and collect a wealth of professional knowledge. PLN is a broader and multifaceted system that often combines many communities, practice networks, as well as locations supporting online and offline learning.

As previously stated, technology offers innovative ways to overcome time and location constraints (Scott, 2010). Teachers engage with digital technologies to build a PLN, interact and connect with other educators, access and share resources, and collaborate to learn (Hilt, 2015). Digital technology allows engagement in collaborative learning related to pedagogical techniques and best practices. The online community can decrease classroom isolation by promoting collaboration between like-minded teachers in their schools, teachers among schools in all districts and nationally, and even with various individuals worldwide. This extensive interaction broadens the perception of teaching and learning in different contexts. As a comparison, some organizations form PLN by forming multidimensional connections and interactions, comparable to spiders weaving webs. Meanwhile, the networks can promote the relationship between each teacher and the community to collectively improve the quality of school learning (Day, 2004).

Networked learning presumes that learning and understanding result from relational interaction and conversation. Collaboration, participation, and responsibility play a central role in the learning process. PLN promotes interaction through discussions, relying on participants' active participation and responsibility in their professional learning process. In detail, Dirckinck-Holmfeld explained that there are several values in networked learning, namely 1) Cooperation and collaboration in the learning process, 2) Working in groups and communities, 3) Discussion and dialogue, 4) Promoting independence in the learning process, 3) Diversity and teachers' position as the centre of the learning process, 4) Trust and relationships, 5) Reflection and self-investment in networked learning processes, and 6) Technology that acts as a liaison and mediator (Dirckinck-Holmfeld et al., 2012).

Elements of Teachers' Professional Learning Network (PLN) Activities

Krutka et al. identified five critical elements of teachers' PLN activities, namely engaging, discovering, experimenting, reflecting, and sharing (Krutka et al. 2016). Engaging with PLN activities can occur in various ways, for example, on a local level by attending school meetings or regional conferences and connecting with educators globally in affinity spaces. Discovering is conducted by expanding new ideas, learning resources, teaching models, and strategies. This is achieved by connecting with colleagues with various backgrounds and ways of thinking, including ideas and resources. Experimenting refers to the effort and process of reflection on testing new ideas, learning resources, teaching models, and strategies. Therefore, with the involvement in learning activities, teachers can gain the confidence to implement new ideas, teaching methods and strategies, and technology in their classrooms. Reflecting is performed by evaluating the implementation results, the impact on the learning process, and the effect on student learning outcomes. Teachers use sharing as a multidirectional process to disseminate information, knowledge, skills, and resources. This process promotes them to hone and demonstrate their expertise as well as contribute to increasing competence and professionalism in improving students learning processes and outcomes.

Social Media Platform

Social media is a web and mobile-based platform built using Web 2.0 technology. It allows users at the micro, meso, and macro levels to share and geotag user-created content (images, text, audio, video, and

games), as well as collaborate and build networks (Ouirdi et al., 2014). The growth of Web 2.0 services has made the read/write web a reality, allowing people to become creators of online information, produce original content, make comments, mark objects, and mix other people's content. Moreover, it offers excellent opportunities to distribute ideas and creative artefacts worldwide (Ng, 2015). The current information age supports web users to take a new attitude and role when accessing the internet by searching for information, interacting, collaborating, producing, and publishing content (Coutinho & Lisbôa, 2013). The emergence of Web 2.0 sites and social media platforms has facilitated and provided teachers with learning opportunities (Trust et al., 2016).

The rapidly advancing information and communication technology promote the growth and development of various social media platforms, each of which has advantages and disadvantages. Social networking sites allow teachers to engage in professional development practically and collaboratively. These opportunities change teachers' forms and daily experiences to be shared and discussed. The discussions provide a chance to focus on an issue and critically discuss subject-related materials or pedagogical skills. Even though the quality of sharing knowledge on social media varies, the activities show a new dimension and dynamic of teachers' daily experience (Liljekvist et al., 2017).

Teachers' Demographic Factors

SSeveral research showed how teachers' demographics need to be a concern in professional development and learning. An example is the disposition of the program designer to pay attention to demographic factors for a successful teachers' professional development (Loucks-Horsley et al., 2010; Saka, 2013). Another research demonstrated that the consideration of program elements, such as teachers' demographic factors, informs refinement and delivery strategies to reveal specific teaching resources that optimize the benefits received when participating in the program (Downer et al., 2009). Furthermore, in making decisions about professional development programs that lead to teachers' learning, two crucial issues require further research, namely aspects of learning and the effect of demographic factors (Copur-Gencturk & Thacker, 2021). While teachers' professional development is not a one-size-fits-all approach, the results of Powell's research showed that length of teaching experience, expertise, and context, play an essential role in shaping perceptions of experience and participation in online professional development (Powell & Bodur, 2019). Based on the above research, it is crucial to examine teachers' participation in PLN from the point of view of teachers' demographic factors.

METHOD

This research used a non-experimental quantitative design, and the teachers' professional learning network activities questionnaire (TPLNAQ) retrieved the research data.

Participants

AAs many as 504 teachers were sampled in this research. They participated in PLN in three teachers' learning communities, namely Komunitas Guru Belajar Nusantara (Nusantara learning teachers community), Forum Guru IPS (Indonesian social sciences teachers forum), and Sadar IGI (Indonesian teachers association online workshop). These three communities' activities are based on social media such as Facebook, Instagram, Telegram, WhatsApp, and video conferencing. The respondents were from seven island groups and thirty provinces. The participation was conducted anonymously and voluntarily to maintain the ethics of this research. The demographic profile of the respondents is shown in Table 1.

Table 1. Teachers' Demographic Profile

Demographics	f	%
Gender		
Female	318	63.10%
Male	186	36.90%
Age		
21 - 30 years	65	12.90%
31 - 40 years	215	42.66%
41 - 50 years	167	33.13%
51 - 60 years	57	11.31%
Experience		
1 - 10 years	158	31.35%
11 - 20 years	245	48.61%
21 - 30 years	84	16.67%
31 - 40 years	17	3.37%
Qualification		
Postgraduate	118	23.41%
Undergraduate	386	76.59%
Certification		
Passed	343	68.06%
Not yet in	127	25.20%
In process	34	6.75%
Island		
Sumatera, Bangka & Riau Island	79	15.67%
Jawa & Madura	232	46.03%
Bali & Nusa Tenggara	47	9.33%
Kalimantan	43	8.53%
Sulawesi	81	16.07%
Maluku & Maluku Utara	14	2.78%
Papua	8	1.59%

Data Collection and Analysis

The instrument was developed regarding the concept of the five key elements of teachers' PLN experiences by Krutka et al. (2016), namely engaging, discovering, experimenting, reflecting, and sharing (Krutka et al. 2016). The five key elements measure teachers' PLN activities. Furthermore, these indicators were developed into 47 items, consisting of engaging (21 items), discovering (8 items), experimenting (6 items), reflecting (6), and sharing (6). TPLNAQ consists of a four-point Likert-type scale for all items ranging from never (1) to always (4). Respondents filled out online questionnaires through links circulated on social media groups of three teachers' communities, and 504 instruments were filled in before data analysis.

Validity and Reliability of the Instrument

Based on the Summary Statistics Table (Appendix A), 504 respondents gave complete responses to 47 items. Measured Person data showed that MNSQ infit (1.01) and outfit (1.00) were not different from the expected value of 1.00. Therefore, the pattern of answers on the instrument was good. The value of ZSTD

infit (-0.3) and outfit (-0.3), compared to the expectation value of 0.0, showed that the overall pattern had conformity to the model. The data showed that the reliability was 0.95. Based on the criteria rating table of scale instrument quality by William P. Fisher Jr. (Rasch.org, 2018; Sumintono & Widhiarso, 2015), the reliability is classified as excellent. This indicates that the scale discriminated very well between respondents.

Based on the Summary Statistics Table (Appendix A), TPLNAQ results could also be seen on each item. The measured item showed data the MNSQ infit and outfit were not different from the expected value of 1.00. Likewise, when the value of ZSTD infit and outfit is compared to the expectation value of 0.0, the overall item was good and had conformity to the model. The data also showed the reliability of items 0.99 and was classified as excellent according to the criteria rating table of scale instrument quality by William P. Fisher Jr. (Rasch.org, 2018; Sumintono & Widhiarso, 2015). Therefore, the probability of respondents responding to items was high, and the items defined the latent variable very well (Bond & Fox, 2015).

The interaction between 504 respondents and 47 items was described in the Rasch Model calculation through the Cronbach Alpha coefficient. Data showed a value of 0.96 (Appendix A), classified as excellent according to the criteria rating table of scale instrument quality by William P. Fisher Jr. (Rasch.org, 2018; Sumintono & Widhiarso, 2015). This score indicated a high level of interaction between respondents and items, and an instrument with excellent psychometric internal consistency is considered very reliable.

Person and Item Separation Index

PPredictions of how well an instrument can distinguish between respondents' abilities in terms of latency can be shown by the Person Separation index. The greater the separation index, the more likely the respondent will respond to items correctly. On the contrary, the item separation index will show the wide distribution in defining easy and difficult items (Boone et al., 2014). The criterion is that the wider the separation, the more appropriate the spread has to be equal to or more than three (Rasch.org, 2018; Sumintono & Widhiarso, 2015). Based on research data, the Person (4.24) and the Item Separation index (11.18) in the Summary Statistics Table (Appendix A) showed a good spread of TPLNAQ across the range of respondents and items. Therefore, TPLNAQ is appropriate and reliable for identifying teachers' PLN activities' levels.

Unidimensionality Measurement

Predictions of how the instrument calculates what should be measured can be shown by Standardized Residual Variance (Appendix B). The table shows that TPLNAQ has raw and unexplained variance explained by a measure of 45.3% and 8.8%. Based on the criteria rating table of scale instrument quality by William P. Fisher Jr., the minimum requirement for raw variance explained by measure is 20%. Furthermore, when the value is more than 40%, the unexplained variance should ideally not exceed 15% (Rasch.org, 2018; Sumintono & Widhiarso, 2015).TPLNAQ has a good unidimensionality measurement, which means it is considered good in calculating what should be measured. In other words, TPLNAQ effectively measures teachers' PLN activities' levels.

Rating Scale Analysis

Rating Scale Analysis (Appendix C) can be used to verify the ranking of the options used. The table shows that the observed average starts from logit -1.34, -0.32, 0.89, and 2.05 for responses with a score of 1, 2, 3, and 4, with an increase in logit value from option 1 to 4. As a result, there was a monotonic increase, meaning the measurement occurred well. The absence of equal scores on the four options showed that each person could distinguish between responses stating never (lowest level) to always (highest level) in teachers' activities joining PLN.

Data Analysis

The Rasch measurement model software, known as WINSTEPS version 3.73, was used to determine the validity and reliability of the instrument. Furthermore, the data were mathematically transformed by the

software into logit through the logarithmic function. The function converted raw ordinal (Likert-type) data into the same interval scale. Finally, the measurement model was calibrated by the conjoint measurement process (Bond & Fox, 2015; Engelhard Jr, 2013; Linacre, 2012; Sumintono, 2018; Sumintono & Widhiarso, 2015). The results of the program were 1) Summary Statistics to determine the overall quality of responses and items as well as the interactions occurring between the two, 2) Principal Component Analysis to analyze the data measured by the TPLNAQ (unidimensionality), 3) Rating Scale Analysis to verify the ranking of choices, and 4) Differential Item Functioning (DIF) to show that respondents from separate subgroups respond differently to several items.

FINDINGS

Teachers' Professional Learning Network (PLN) Activities Levels

Based on the Measured Person Summary Statistic Table (Appendix A), the overall mean score of +0.68 logit (SD = 1. 17) indicated that all teachers were at moderate levels in PLN activities level. A standard deviation of 1.17 indicated a very wide dispersion level, and teachers' PLN activities' level categorization is described based on demographic factors. The categorization used was empirical normalization based on the logit value of each respondent. Based on the Measured Person Summary Statistics Table (Appendix A), the data had a minimum and maximum of -2.14 and 4.08, respectively. The data categorized the scores into certain intervals using the Person Strata formula (Rasch.org, 2019; Wright & Masters, 2002). The results are classified into 4 categories, namely very high (2.53 - 4.08), high (0.97 - 2.52), moderate ((-0.59) - 0.96), and low ((-2.14) - (-0.58)), as seen in Table 2.

Table 2. Teachers' PLN Activities Level, Overall and According to Demographics

Demographics	Very High		High		Moderate		Low	
	f	%	f	%	f	%	f	%
Overall	33	7%	150	30%	258	51%	63	13%
Gender								
Female	18	6%	92	29%	165	52%	43	14%
Male	15	8%	58	31%	23	12%	90	48%
Age								
21 - 30 years	1	2%	20	31%	38	58%	6	9%
31 - 40 years	19	9%	68	32%	101	47%	27	13%
41 - 50 years	11	7%	47	28%	90	54%	19	11%
51 - 60 years	2	4%	15	26%	29	51%	11	19%
Experience								
1 - 10 years	3	2%	50	32%	88	56%	17	11%
11 - 20 years	23	9%	64	26%	128	52%	30	12%
21 - 30 years	6	7%	32	38%	33	39%	13	15%
31 - 40 years	1	6%	4	24%	9	53%	3	18%
Qualification								
Postgraduate	7	6%	49	42%	51	43%	11	9%
Undergraduate	26	7%	101	26%	207	54%	52	13%
Certification								
Passed	23	7%	105	31%	169	49%	46	13%
Not yet in	8	6%	36	28%	67	53%	16	13%
In Process	2	6%	9	26%	22	65%	1	3%

Differences in Teachers' Professional Learning Network (PLN) Activities Based on Demographic Factors

Inferential statistics of testing differences in teachers' PLN activities using analysis of variance (ANOVA) showed that only the qualifications factor had a significant difference at $p < 0.05$ (Table 3). Other demographic factors such as gender, age, teaching experience, and certification did not show any significant difference statistically.

Table 3. ANOVA of Teachers' Demographic Factors

Demographics	F-test
1. Gender	0.280
2. Age	1.818
3. Experience	0.267
4. Qualification	5.844*
5. Certification	0.125

Note: *$p < 0.05$

Differential Item Functioning (DIF) of Respondents' Demographic Factors in Teachers' Professional Learning Network (PLN) Activities

The next step is to analyze the differences between the respondents' demographic factors. The level of activity in PLN is measured based on the concept of the five key elements of experiences from Krutka et al. (2016), namely engaging, discovering, experimenting, reflecting, and sharing. This was analyzed using Differential Item Functioning (DIF) analysis, which showed that respondents from separate subgroups responded differently to several items, thereby measuring different involvement at the item level (Boone et al., 2014). DIF analysis results showed that the demographic factors of gender, age, teaching experience, qualifications, and certification had significant response differences. Based on the DIF size standard (> 0.5 log) and the DIF t-value (> 2.0) (Bond & Fox, 2015; Boone et al., 2014), there were 14 out of 47 items with different demographic factors, as shown in Table 4 and Appendix D.

Table 4. Summary of Differential Item Functioning Based on Teachers' Demographic Factors

Demographic Factors	Item of Teachers' PLN Activities					Total
	Engaging	Discovering	Experimenting	Reflecting	Sharing	
Gender	q12	-	-	-	-	1
Age	q1, q12	-	-	-	-	2
Experience	q1, q6, q10, q12, q17	-	-	-	-	5
Qualification	q8, q12, q13, q16,	q23, q26,	q34, q35,	-	q42	9
Certification	q1, q5, q12	-	-	-	-	3

The differences among teachers, namely gender, age, teaching experience, qualifications, certification, and PLN activities level, are described. The analysis for each demographic factor mentioned is presented below.
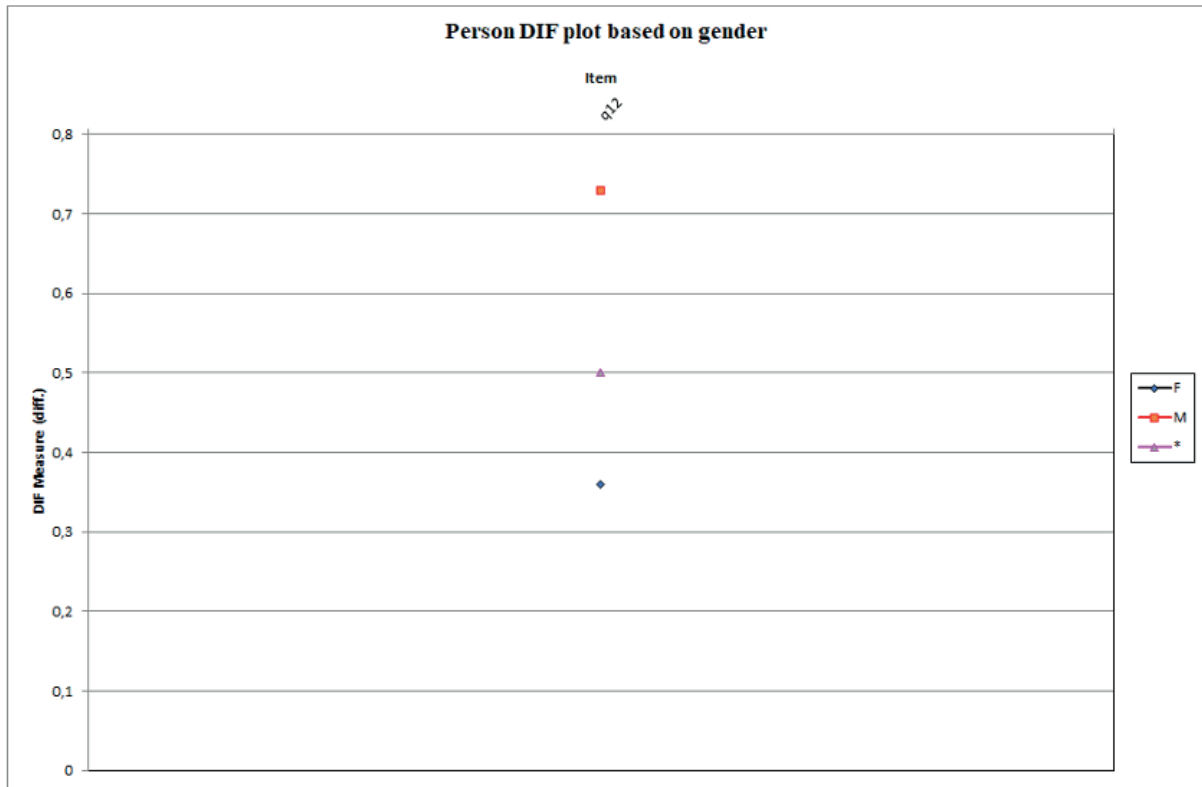
Note: F = Female M = Male * = Average

Figure 1. Person DIF Plot Based on Gender

Based on respondents' responses, one item on engagement elements was identified as having a significant difference based on gender (Table 4). Meanwhile, the other elements, such as discovering, experimenting, reflecting, and sharing, did not significantly differ. Figure 1 shows that the activities of female teachers were at a higher level than male in one of the engaging items, namely participating in professional learning activities in the form of training/technical guidance/workshops/online seminars on their initiative in the social media of teachers' community (Webinar/WhatsApp/Telegram) (q12).

Judging by the age demographic factor, two items were identified as having a significant difference in the engaging element (Table 4). Meanwhile, the other elements (discovering, experimenting, reflecting, and sharing) did not significantly differ. Figure 2 shows that teachers aged 21-30 had a higher intensity of participating in learning activities at community forums (q1). In other PLN activities, older teachers (41-50 and 51-60 years) were more active in the training/technical guidance/workshop/online seminar on their initiative in the social media of teachers' community (Webinar/WhatsApp/Telegram) (q12), compared to younger teachers.
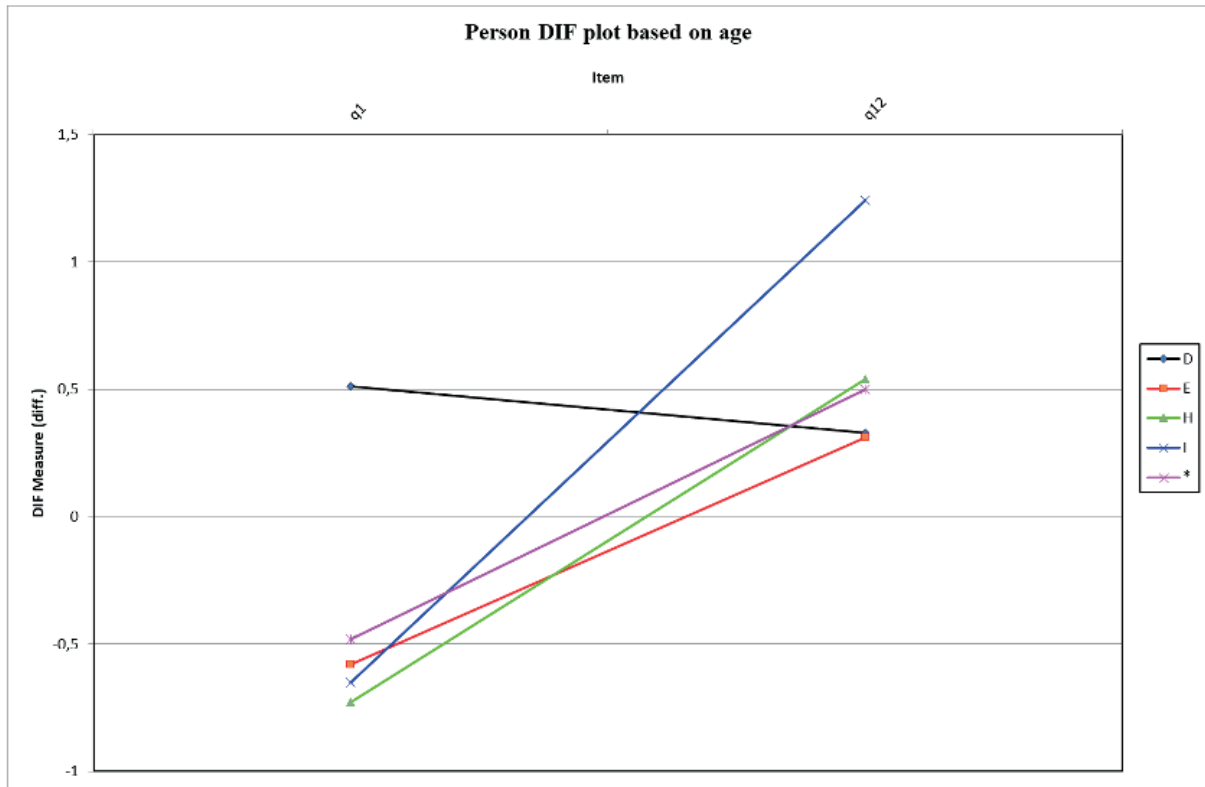
Note: D=21–30 years, E=31–40 years, H=41–50 years, I=51–60 years *=Average

Figure 2. Person DIF Plot Based on Age

Based on the demographic factor of teaching experience, five items were identified as having a significant difference in the engaging element while discovering, experimenting, reflecting, and sharing did not show a significant difference (Table 4). Figure 3 shows that teachers with less teaching experience tended to be more actively participating in learning activities (q1), discussing and sharing the results of observation, evaluation, and reflection with colleagues at school (q6), and joining the training/technical guidance/ workshop/seminar in the school internally (q10). Teachers with excellent teaching experience tended to be more active in joining the training/technical guidance/workshop/online seminar in the social media of teachers' community (Webinar/WhatsApp/Telegram) (q12) and implementing knowledge/experience in teaching practices discussed in the social media of teachers' community (q17).
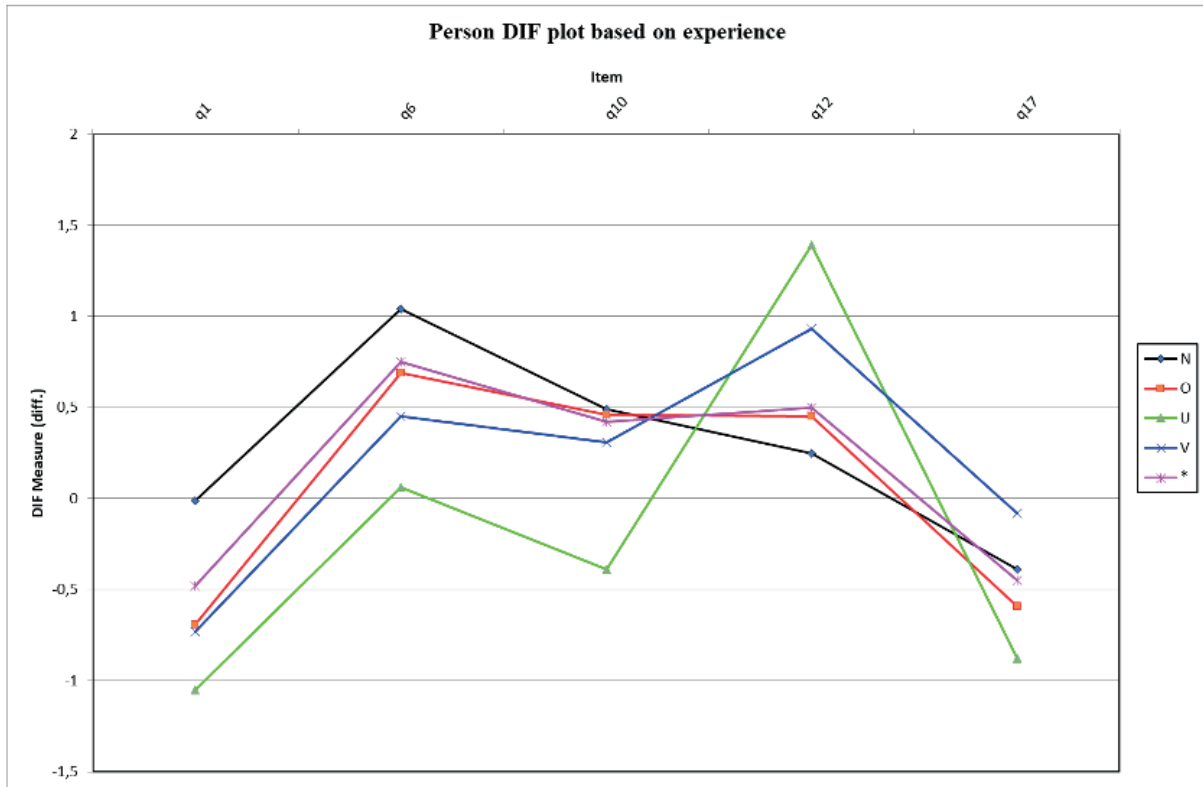
Note: N=1–10 years, O=11–20 years, U=21–30 years, V=31–40 years *=Average

Figure 3. Person DIF Plot Based on Experience

Meanwhile, judging by teachers' qualifications and demographic factors, there were nine items identified as having significant differences in several elements, engaging (4 items), discovering (2 items), experimenting (2 items), and sharing (1 item). There are no items with significant differences in the reflecting element (Table 4). Figure 4 shows that undergraduate education teachers performed better in four activities on elements engaging, experimenting, and sharing. These include joining the learning innovation competition (q8), writing the results of implementation and reflection in the form of scientific papers (q34), publishing the results of implementation and reflection in the form of scientific journal articles (q35), and reflecting on the learning tools used (q42). Furthermore, postgraduate education qualification tended to be more active in five activities on elements engaging and discovering. These include terms of training/technical guidance/workshop/online seminar on their initiative in the social media of teachers' community (Webinar/WhatsApp/Telegram) (q12), actively participating in various learning activities (q13), reading and learning about knowledge/experience in teaching uploaded on the social media of teachers' community (q16), trying to obtain information that could change the new perspective in teaching following the current context when participating in learning activities through the teachers' community (q23), and trying to obtain innovative and applicable teaching strategies when participating in learning activities (q26).

Person DIF plot based on qualification
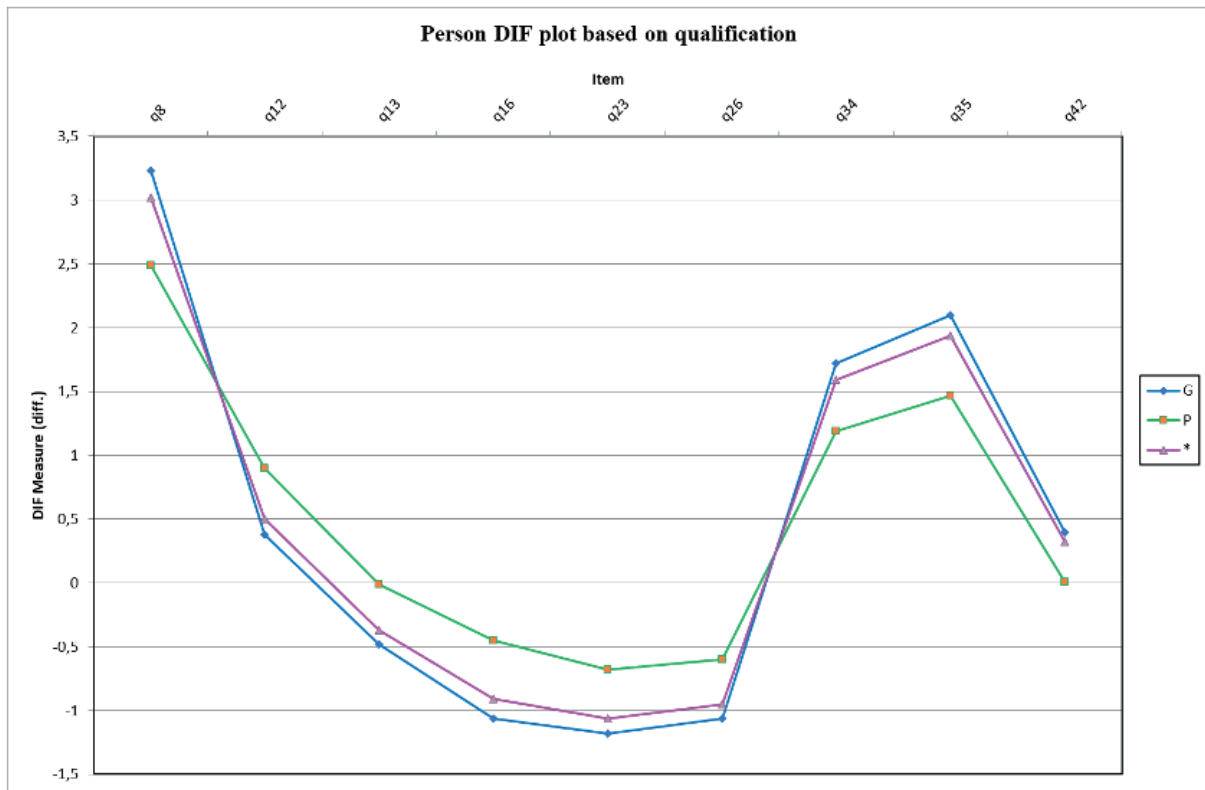
Note: G = Bachelor P = Postgraduate * = Average

Figure 4. Person DIF Plot Based on Qualification

Based on the teaching certification's demographic factor, three items were identified with a significant difference in the engaging element, unlike others (Table 4). Figure 5 shows that teachers who have not participated in the certification program are more active in learning activities (q1), and those who were in the process tended to be more active in writing the results of observation, evaluation, reflection, or innovation development in the form of scientific papers (q5). Meanwhile, those who have passed the certification program tended to be more active in participating in training/technical guidance/workshops/online seminars on their initiative in the social media of teachers' community (Webinar/WhatsApp/Telegram) (q12).
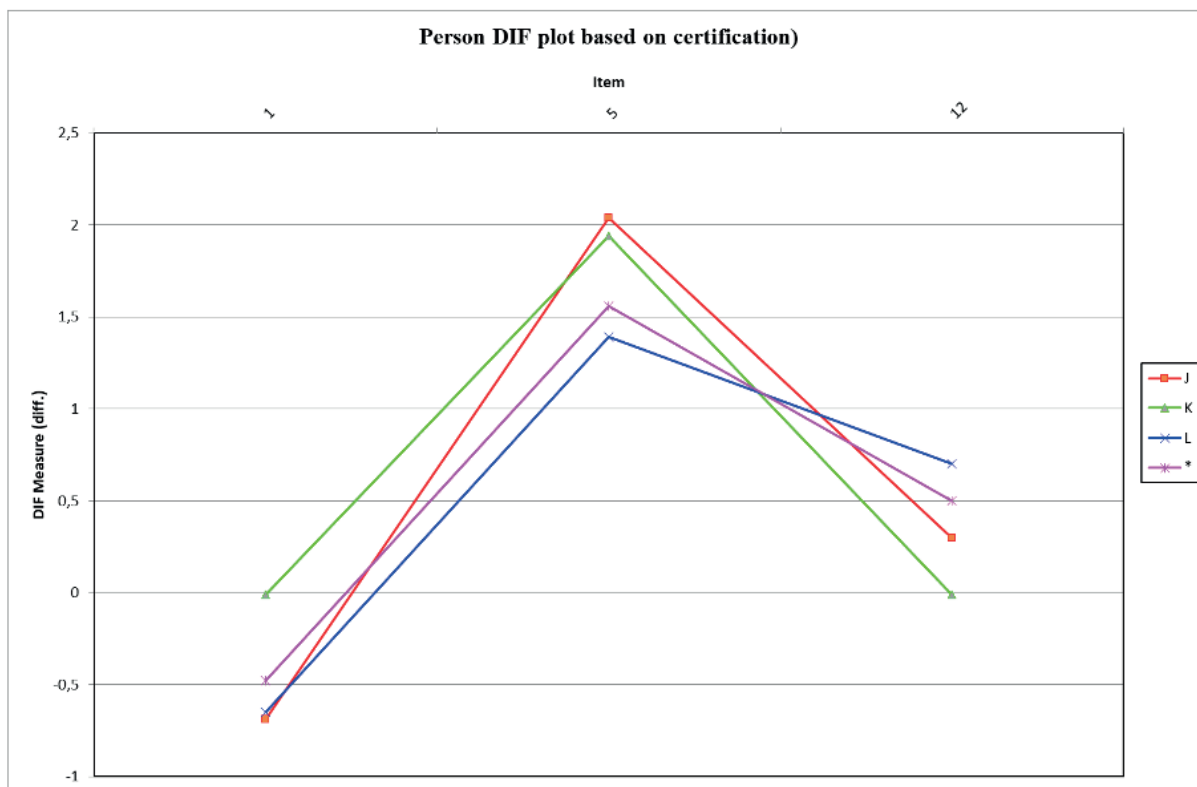
Note: J = In Process K = Not yet L = Passed * = Average

Figure 5. Person DIF Plot Based on Certification

DISCUSSIONS

The findings indicated that all teachers were moderately in PLN activities. Therefore, teachers who join the social media-based PLN need to optimize their participation in professional learning activities. The data showed that only 37% of teachers were in high and very high categories, and 13% were still in the low level. Various research showed that social media is a potential tool to support professional learning. It can provide opportunities for teachers to connect, demonstrate a transformation of teachers' development strategies, and potentially increase professionalism in terms of applying their professional and pedagogical competencies (Patahuddin & Logan, 2019; E. Sari et al., 2012a; E. Sari & Lim, 2012a, 2012b; E. R. Sari, 2012; Sumaryanta et al., 2019). Furthermore, professional learning is a means to improve knowledge and skills in teaching practices. Teachers will gain a great deal, particularly during in-class practice, when the planning, processes, activities, and evaluations are well-managed. Therefore, there needs to be reflection and assessment of teachers' activities, forms of activities, and professional learning content. Previous research reported that several steps should be taken to maximize the benefits of learning to increase participants' engagement. These steps are that the activities designed should have a focus on content, emphasize an active learning approach related to policies and curricula, time sufficient and appropriate, develop collaborative participation, and determine the tasks and content of teachers' learning activities (Tanang & Abu, 2014; Zhang & Liu, 2019).

The variance analysis (ANOVA) indicated that only teachers' education qualifications differed significantly. At the same time, other demographic factors such as gender, age, teaching experience, and certification did not show statistically significant differences. However, some instrument items showed substantial differences in response to the teachers' sampled demographic factors, as described below.

Regarding gender demographic factors, the research data showed no significant difference in PLN's activity level between male and female teachers. However, female teachers are at a better level than male, namely on activities in participating in training/technical guidance/workshops/online seminars on their initiative on the social media of teachers' community (Webinar/WhatsApp/Telegram). This is in line with the findings of

previous research, which showed that in the use of technology, female teachers used various ICT resources and tended to be more active in using ICT in their classrooms. These have been taken to build networks and connect with the more incredible world to access information (Wiseman et al., 2018). Other research showed that male teachers significantly differed in the use and preferences of ICT tools and devices from female. However, they differed significantly in their use and preferences for online services (WhatsApp, text messaging, and search engine literature) from male teachers (Yaokumah et al., 2019). Online courses or training utilizing technology such as video and web conferencing and social media applications such as WhatsApp and Telegram have become a means to develop professional development more actively. In addition, social media-based PLN is implemented online, requiring flexible time in its implementation. Some females may face constraints such as lack of time due to other responsibilities. Variations in participation and time flexibility significantly affect online learning completion for females (Veletsianos et al., 2021). The masculinity dimension shows that Facebook and Synchronous Online Conferencing applications, such as Skype, can facilitate female teachers to participate more actively in academic discussions and interactions. Even though male members were more assertive than their peers, most female members had a firm voice in academic discussions (E. Sari & Lim, 2012a).

In the age demographic factors, there were no significant differences between the several groups regarding the Professional Learning Network activities level. However, some factors were identified as having significant differences. Research data showed that teachers aged 21-30 are more active in learning activities in community forums. Meanwhile, teachers of older age (41-50 and 51-60 years) were more involved in the training/technical guidance/workshop/online seminar activities on their initiative on social media (Webinar/WhatsApp/Telegram). This appears to be relevant to research findings on the teaching experience factor. This factor did not significantly differ among several teaching experience groups regarding PLN activities level. However, there were several activities identified that showed differences. For example, those with less teaching experience tended to be more active in several activities, such as participating in learning activities, discussing and sharing the results of observation, evaluation, and reflection with colleagues at school, and joining the training/technical guidance/workshop/seminar in the internal school. Meanwhile, those whose teaching experience was greater tended to be more active in other activities, namely joining the training/technical guidance/workshop/online seminar on their initiative (Webinar/WhatsApp/Telegram) and implementing knowledge/experience in teaching practice discussed in the social media of teachers' community.

The findings on the age factor and teaching experience were in line with the concept of the professional life phase of teachers (Day, 2008, 2013; Day & Gu, 2007; Sammons et al., 2007). In the initial phase, the young teachers whose teaching experience is less focused on learning to build their identity and competence in the classroom and developing evidence and responsibility in their work to motivate, foster commitment, and behave effectively. In this phase, the influence of the principal, colleagues, and culture in the school becomes an essential factor in becoming a professional teacher. Therefore, school leaders need technology leadership to promote young teachers to start active in professional learning or development. In this case, the suitable activities of young teachers will positively impact the school. This can be exemplified by a research that significantly influenced professional development as a moderating factor between technology leadership and school integration (Thannimalai & Raman, 2018). Young teachers with less teaching experience actively represent that phase in the learning process and their communities through professional development, building a sense of professional identity, and creating effective classes and learning. This is also consistent with other research, where young and middle-aged learning about oneself tends to be shown (Louws et al., 2017). The findings indicated that young teachers have considered the importance of teachers' community forums, discussions with colleagues, and learning activities in internal schools to become appropriate professional tools.

In the final phase of professional life, old teachers with experience have shifted to maintain their commitment and effectiveness until they slowly show lower performance. This phase requires strong support from various sides, from the internal and external school as well as the family of teachers (Day, 2008, 2013; Day & Gu, 2007; Sammons et al., 2007). The results indicated that teachers at this phase tend to take the initiative to be more active in informal activities to obtain external support, such as being involved in teachers' community, professional organizations, and social media. Other research showed that mid-career teachers and those in the final years of their careers tend to be active and learn about technological innovations for classroom

learning (Louws et al., 2017). These can be obtained from informal activities through learning from other teachers about the activities of the community and social media. The findings indicated that older teachers with more excellent experience tend to be more active in online learning activities (Webinar/WhatsApp/Telegram). They also showed the same indications on implementing knowledge/experience in teaching, which were discussed on the social media of teachers' community.

There are several differences based on age and teaching experience, which are also reinforced by the concept of the phases of professional teachers' life. It is necessary to pay attention to the meaning of the concept when discussing professional development. In determining the level of significance, self-actualization and self-transcendence play an essential role. The meaning of life is directly proportional to the development of talents and potential as well as the fulfillment of a person's quality and capacity (Suyatno et al., 2020).

Judging by the demographic factors of teachers' qualifications, the research findings showed a significant difference in PLN activities level between undergraduate and postgraduate education qualifications. Teachers with postgraduate qualifications tended to perform better at PLN activities level. However, some activities were identified as having differences. They tended to be more active in training/technical guidance/workshop/online seminars on social media (Webinar/WhatsApp/Telegram) and actively participating in various activities. The same indication was also shown in the following activities, reading and learning about knowledge/experience in teaching practice uploaded on social media, analyzing information that changes the new perspective in teaching, and looking for innovative and applicable strategies. Therefore, better educational qualifications of teachers will promote knowledge, understanding, perceptions, and activities in terms of PLN activities. This finding aligns with previous research, where academic qualifications significantly affect professional behaviour and learning activities (Tanang & Abu, 2014). Furthermore, there is a significant relationship between teachers' qualifications and perceptions of community-based professional learning practices. The qualifications at the school level can increase with their perceptions about learning practices, provide solid professional learning, and contribute to their understanding of the forms of teachers' development (Ho et al., 2016; Williams, 2011).

Based on the demographic factors of certification, the research findings did not show any significant difference in PLN activities level among teachers who have passed the certification program with those in the process of participating. The findings also showed that there was not much difference in the level of activity in various professional learning activities. Teachers who have not participated in the certification program tended to be more active in learning activities in the community forums. Teachers in the process of experiencing were more involved in writing observations, evaluations, reflections, or innovation development in the form of scientific papers.

Teachers who passed the certification program tended to be more active in training/technical guidance/workshops/online seminars on their initiative on the community's social media (Webinar/WhatsApp/Telegram). In the context of professional development, the certification program is a government obligation stipulated in the law as a form of quality assurance. It determines teachers' eligibility in carrying out their duties as professional educators, improves the process and learning outcomes, improves teachers' welfare, and increases their dignity to realize quality national education (Maisah et al., 2019; Marzuki, 2009). The certification program has not been optimized to promote teachers to develop competence and professionalism. This is in line with teachers reform conducted by the World Bank and other research that showed no substantial evidence of the effectiveness of certification (Chang et al., 2014; Kusumawardhani, 2017). Research findings on the demographic factors showed a significant challenge for teachers who have passed certification. Since teachers have been declared to meet the standards, they should continue to maintain and develop the competence and professionalism by maximizing activities in professional learning. The main objective of the Indonesian government's incentives is to optimize the use of these incentives to develop competence and professionalism.

Several specific PLN activities items had significant differences in all teachers' demographic factors, specifically in the engaging element, as shown in Table 4. Therefore, they should be essential in designing, implementing, and evaluating professional learning programs, including PLN with social media platforms. This is in line with the recommendations of several previous research that paid attention to teachers' demographics in professional development programs, specifically to attract participation in various learning activities (Copur-

Gencturk & Thacker, 2021; Downer et al., 2009; Loucks-Horsley et al., 2010; Powell & Bodur, 2019; Saka, 2013). The learning community should facilitate differentiated learning activities to accommodate teachers' diverse characteristics (demographics). Practically, they have to prepare topics, activities, models, and learning modes that vary according to the needs. This will increase their participation in various PLN activities in terms of engaging, discovering, experimenting, reflecting, and sharing. Based on this research data, teachers with postgraduate educational backgrounds need to facilitate learning innovation activities, writing the results and reflection, publishing scientific journal articles or best-practice books, and reflecting on the learning tools used.

Another example is the young teachers whose experience is less, which needs to be facilitated in activities to build their identity and competence to motivate, foster commitment, and behave effectively. Meanwhile, old teachers with experience tend to take the initiative to be more active in informal activities as a means of receiving external support in teachers' community, professional organizations, and social media (Day, 2008, 2013; Day & Gu, 2007; Sammons et al., 2007). Teachers who have not passed certification are more active in learning activities through internal forums in teachers' community that facilitate PLN. Therefore, they need to be promoted and prioritized to join the certification program. Teachers in the certification program process are more active in writing the results of observation, evaluation, reflection, or innovation development in the form of scientific papers. They should be allowed to demonstrate their competence in teaching through writing scientific journal articles, community newspapers, or best-practice books. Teachers who have passed the certification have more initiative to participate in self-development programs through training/technical guidance/workshops/online seminars. They need to be facilitated by organizing these events in the teacher-learning communities. The information related to the event is through the community's social media. Practically, accommodating the diversity of needs due to the various demographic factors will promote an increase in teachers' activity and participation in social media-based PLN.

This is also a challenge for policymakers working on developing professional learning for teachers in Indonesia. The development of teachers' communities oriented toward professional learning should also be facilitated. Existing communities should be directed towards effective professional learning for real benefits. In terms of effective professional learning, Jana Hunzicker explained that the involvement of teachers in learning activities focused on teaching, collaboration, and sustainability is the key to effective development (Hunzicker, 2011). With these characteristics, they are more likely to consider relevant and authentic professional learning to improve teaching practices. Sitti Maesuri Furthermore, Patahuddin also stated the same idea that effective professional learning fulfills at least five characteristics, namely 1) focuses on an event that is conducted and ongoing, 2) collaborative and aims to develop a learning community among teachers, 3) student-oriented, focuses on student-centered approaches to teaching, 4) considers individual teachers and their context, and 5) the main focus is to increase knowledge for teaching (Patahuddin & Logan, 2019). The realization of effective professional learning will motivate teachers to participate more actively in various activities, and active participation significantly positively impacts beliefs and practices as well as student performance (Tanang & Abu, 2014).

CONCLUSION

Indonesia needs to utilize technology to develop competencies and professionalism, with a more than four million teachers' population. PLN using social media platforms are one form of implementation of technology by teachers' communities in the context of informal professional learning. This research has investigated three communities in Indonesia, and the findings indicated that all teachers had a moderate level of PLN activities. Generally, teachers who participated in social media-based PLN still need to improve their activities when participating in professional learning such as engaging, discovering, experimenting, reflecting, and sharing. Even though only qualification factors showed significant differences in almost all elements, several specific PLN activities items had substantial differences, specifically in the engaging element. Theoretically, this research provides insight that teachers' demographic factors should be essential in designing, implementing, and evaluating professional learning programs, including PLN with social media platforms. Attention will build positive perceptions of learning experiences, promote active participation, inform program improvement and delivery strategies, and uncover specific teaching resources. This research

recommends that conformity with teachers' demographic factors can increase PLN experiences in terms of engaging, discovering, experimenting, reflecting, and sharing. The learning community should prepare topics, activities, and modes of teachers' learning. Accommodating the diversity of needs due to the various demographic factors will promote teachers' activity and participation in social media-based PLN.

Research Limitations and Future Research Needs

Concerning the limitation of this research, the sample is small compared to the population in Indonesia, which is more than four million teachers. Furthermore, the three teachers' communities investigated were few compared to that of Indonesia. Current phenomenon is the rapidly growing number of teachers' communities whose base of professional learning activities utilize social media platforms. This research is also limited to a quantitative perspective, hence, it has not been investigated deeply through qualitative perspectives, such as motives, obstacles, challenges, and benefits teachers feel when participating actively in social media-based PLN.

The recommendation is for further findings to be interested in analyzing social media-based PLN in terms of teachers' demographics, such as factors with a dominant influence on teachers' activities. In addition, it examines how the demographic characteristics of teachers affect learning outcomes in PLN. The preferences of teachers in using social media and their influence on the activity level are seen from demographic factors. These should be studied to provide meaningful input for evaluating and redesigning an effective social media-based PLN. It is also suggested to complement the following research with a qualitative perspective to obtain more comprehensive data and explore the impact of change on students.

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APPENDIX A

Summary Statistic

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INPUT: 504 Person  47 Item  REPORTED: 504 Person  47 Item  4 CATS  WINSTEPS 3.73
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      SUMMARY OF 504 MEASURED Person
--------------------------------------------------------------------------------
|          TOTAL                      MODEL      INFIT       OUTFIT   |
|          SCORE     COUNT   MEASURE   ERROR   MNSQ  ZSTD   MNSQ  ZSTD |
|--------------------------------------------------------------------|
| MEAN    132.7      47.0      .68      .24    1.01  -.3    1.00  -.3 |
| S.D.     20.3       .0      1.17      .03     .51  2.5     .50  2.4 |
| MAX.    179.0      47.0     4.08      .39    2.41  5.1    2.42  4.6 |
| MIN.     76.0      47.0    -2.14      .21     .18 -6.0     .17 -6.1 |
|--------------------------------------------------------------------|
| REAL RMSE   .27 TRUE SD   1.14  SEPARATION 4.24  Person RELIABILITY  .95 |
|MODEL RMSE   .24 TRUE SD   1.15  SEPARATION 4.75  Person RELIABILITY  .96 |
| S.E. OF Person MEAN = .05                                          |
--------------------------------------------------------------------------------
Person RAW SCORE-TO-MEASURE CORRELATION = .99
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .96

      SUMMARY OF 47 MEASURED Item
--------------------------------------------------------------------------------
|          TOTAL                      MODEL      INFIT       OUTFIT   |
|          SCORE     COUNT   MEASURE   ERROR   MNSQ  ZSTD   MNSQ  ZSTD |
|--------------------------------------------------------------------|
| MEAN   1423.3     504.0      .00      .07     .98  -.8    1.00  -.5 |
| S.D.    174.8       .0       .86      .00     .33  4.5     .32  4.3 |
| MAX.   1638.0     504.0     3.02      .08    2.27  9.9    2.23  9.9 |
| MIN.    792.0     504.0    -1.15      .07     .55 -8.2     .56 -8.2 |
|--------------------------------------------------------------------|
| REAL RMSE   .08 TRUE SD   .86  SEPARATION 11.18  Item   RELIABILITY  .99 |
|MODEL RMSE   .07 TRUE SD   .86  SEPARATION 11.81  Item   RELIABILITY  .99 |
| S.E. OF Item MEAN = .13                                            |
--------------------------------------------------------------------------------
UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -1.00
23688 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 42769.06 with 23136 d.f. p=.0000
Global Root-Mean-Square Residual (excluding extreme scores): .6153
```

APPENDIX B

Standardized Residual Variance

```
INPUT: 504 Person  47 Item  REPORTED: 504 Person  47 Item  4 CATS  WINSTEPS 3.73
--------------------------------------------------------------------------------

      Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                        -- Empirical --    Modeled
Total raw variance in observations    =   85.9 100.0%       100.0%
  Raw variance explained by measures  =   38.9  45.3%        44.8%
    Raw variance explained by persons =   16.9  19.7%        19.5%
    Raw Variance explained by items   =   22.0  25.6%        25.3%
  Raw unexplained variance (total)    =   47.0  54.7% 100.0%  55.2%
    Unexplned variance in 1st contrast =   7.6   8.8% 16.2%
    Unexplned variance in 2nd contrast =   4.7   5.5% 10.0%
    Unexplned variance in 3rd contrast =   4.2   4.9%  9.0%
    Unexplned variance in 4th contrast =   3.2   3.7%  6.8%
    Unexplned variance in 5th contrast =   2.1   2.4%  4.4%
```

APPENDIX C

Rating Scale Analysis

```
INPUT: 504 Person  47 Item  REPORTED: 504 Person  47 Item  4 CATS  WINSTEPS 3.73
--------------------------------------------------------------------------------


SUMMARY OF CATEGORY STRUCTURE.  Model="R"
-------------------------------------------------------------------
|CATEGORY    OBSERVED|OBSVD SAMPLE|INFIT OUTFIT|| ANDRICH |CATEGORY|
|LABEL SCORE COUNT %|AVRGE EXPECT| MNSQ  MNSQ||THRESHOLD| MEASURE|
|-------------------+-----------+------------++---------+--------|
| 1    1    1800   8| -1.34 -1.39| 1.05  1.06||  NONE   |( -3.11)| 1
| 2    2    5250  22|  -.32  -.23|  .91   .94|| -1.85   | -1.22 | 2
| 3    3   11955  50|   .89   .83|  .89   .94|| -.53    |   .98 | 3
| 4    4    4683  20|  2.05  2.11| 1.09  1.06||  2.38   |( 3.52)| 4
-------------------------------------------------------------------
OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.


---------------------------------------------------------------------------
|CATEGORY    STRUCTURE   |  SCORE-TO-MEASURE   | 50% CUM.| COHERENCE      |ESTIM|
| LABEL    MEASURE  S.E. | AT CAT. ----ZONE----|PROBABLTY| M->C C->M  RMSR |DISCR|
|-----------------------+---------------------+---------+----------------+-----|
|    1     NONE          |( -3.11) -INF   -2.28|         | 70%  22% 1.1038|     | 1
|    2     -1.85    .03  | -1.22  -2.28   -.25| -2.05   | 50%  51%  .6266| .96| 2
|    3      -.53    .02  |   .98   -.25   2.51| -.38    | 64%  82%  .3870|1.10| 3
|    4      2.38    .02  |( 3.52)  2.51   +INF | 2.43    | 69%  35%  .7901| .94| 4
---------------------------------------------------------------------------
M->C = Does Measure imply Category?
C->M = Does Category imply Measure?


          CATEGORY PROBABILITIES: MODES - Structure measures at intersections
P      -+------+------+------+------+------+------+------+------+-
R  1.0 +                                                       +
O      |                                                       |
B      |11                                                     |
A      | 11                                               4||
B   .8 +   11                                          44 +
I      |    11                                        44   |
L      |      11                                     44    |
I      |       1                333333333           4      |
T   .6 +        1              33         33      4         +
Y      |       11            33             33  44          |
    .5 +        1  2222     3                3*             +
O      |         *22     2223                4 3            |
F   .4 +        22 1       3322              44    33       +
    |           22   1    3      22          4      3        |
R      |        22        11 3    2          44        33    |
E      |       22        3*        22      4         33  |
S   .2 +     22          3 1        22  44          33 +
P      |  222          33    11       4**2            3|
O      |22          333       111   444   222          |
N      |       33333        44***11       22222        |
S   .0 +********4444444444444444      1111111111111111************+
E      -+------+------+------+------+------+------+------+------+-
       -4    -3    -2    -1     0     1     2     3     4
```
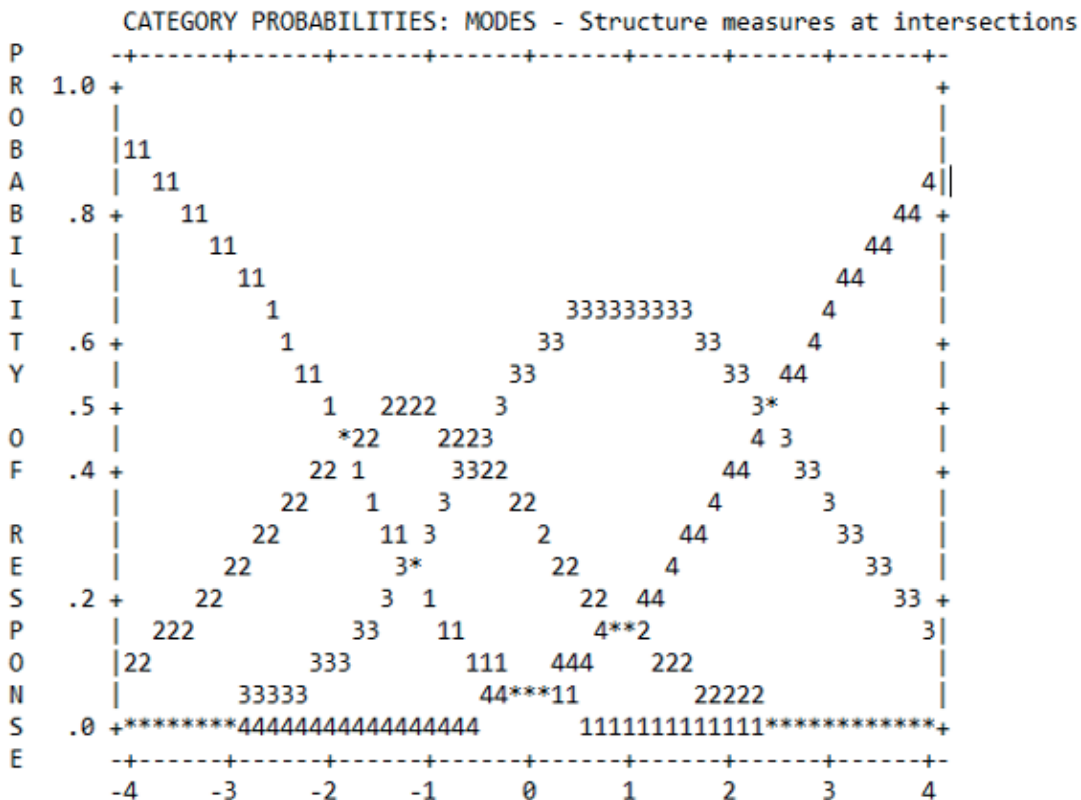
Summary of Differential Item Functioning Based on Teachers' Demographic Factors

Item	Statement	Demographic Factors				
		Gender	Age	Experience	Qualification	Certification
q1	participating in teachers' learning activities at teacher community forums		√	√		√
q5	writing the results of observation, evaluation, reflection or innovation development in the form of scientific papers					√
q6	discussing and sharing the results of observation, evaluation, and reflection with colleagues at school			√		
q8	joining the learning innovation competition				√	
q10	joining the training/technical guidance/ workshop/seminar in the school internally			√		
q12	participating in training/technical guidance/ workshops/online seminars on own initiative in the social media of teachers' community (Webinar/WhatsApp/ Telegram)	√	√	√	√	√
q13	actively participating in various learning activities on the social media of teachers' community				√	
q16	reading and learning about knowledge/ experience in teaching uploaded on the social media of teachers' community				√	
q17	implementing knowledge/experience in teaching practices discussed on the social media of teachers' community			√		
q23	trying to obtain information that could change the new perspective in teaching that is following the current context when participating in learning activities through teachers' community				√	
q26	trying to obtain innovative and applicable teaching strategies when participating in learning activities through teachers' community				√	
q34	writing the results of implementation and reflection in the form of scientific papers				√	
q35	publishing the results of implementation and reflection in the form of scientific journal articles or best practice books				√	
q42	reflecting on the learning tools used so far				√	

EXAMINING ONLINE DESIGN STUDIO COURSE EXPERIENCES OF STUDENTS, ACADEMIC SUPERVISORS AND COMPANY MENTORS IN INDUSTRIAL DESIGN PROGRAM

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ABSTRACT

The aim of this study is to share the experiences and the collaborations carried out within the sector during the pandemic period, in a graduation project which is focused on university-industry cooperation - in order to make the role of the designer in the sector more effective, to transform education into a comprehensive sectoral experience for students and to offer the sector the experience of working with the designer at Department of Industrial Design, Eskisehir Technical University. The method of the research is a case study examining by designing it with a holistic single-case design since it is a single, representative, and typical case. In the case study, the research group consists of the students who were enrolled in the 2019-2020 spring term graduation project course, academic supervisors and company mentors at Eskisehir Technical University, Turkiye. The result of the study is that pandemic opened the door to new educational experiences for design academics, students and companies. This sharp bend mainly affected the implementation processes of one-on-one lessons, just like the design studio, which we define as the heart of design education. It has also paved the way for different online interactive educational tools and platforms to be used for the educational components of the design of the process.

Keywords: Industrial design, online design course, online learning, design education, case study.

INTRODUCTION

Due to the COVID-19 outbreak, face-to-face educational activities in higher education institutions were initially suspended; only to continue online after a while. The opportunities that online education has provided depended on time and place, i.e., flexible applications, came into play with surprising speed. This rapid transition process in the application-intensive and essentially one on one and face-to-face disciplines such as industrial design has enabled/created an environment for the discovery and application of different interface solutions and experiences.

Education for designers (like nearly all kinds of education) is based on learning skills, nourishing talents, understanding the concepts and theories, and acquiring philosophy (Meyer and Norman, 2020). The basis of this approach is established on the perspective of producing and applying together. This situation is primarily and especially valid for the design studio, which is the core of design education, because design is a complex field. It is both a practical and an academic discipline. Each category encompasses numerous specialized disciplines whose parameters are fluid, ill-defined, and changing continually, with a number of different design societies dedicated to them (Meyer and Norman, 2020). Though design education involves a practical education approach that targets getting industrial products, which focus on user needs, ready for production, "practical" not only means the manufacturing process but also the mental practicality that the student performs during the process. While designing, the learning process is mostly not a sequential action but structured within the student's experiences. For this reason, the process of learning by doing, which is the basis of design education, is carried out one-on-one, thus face-to-face education forms the backbone of industrial design education, particularly the studio course.

The studio is a place where students learn by doing, a venue for hands-on learning that requires students to take an active role in engaging with and incorporating distinct components of the curriculum into a comprehensive project (Yocom, Proksch, Born & Tyman, 2012). The design studio is a type of professional education, traditional in schools of architecture, in which students undertake a design project under the supervision of a master designer. Its setting is a loft-like studio space in which anywhere from twelve to as many as twenty students arrange their drawing tables, papers, books, pictures, drawings, and models. In this space, students spend much of their working lives, at times talking together, but mostly engaged in private, parallel pursuits of the common design task (Schon, 1983).

The essential elements of studio-based learning – learning by doing, collaborating with the environment (other students, instructors, and external stakeholders), and re-doing until an agreement is reached among stakeholders (Lackney, 1999) is considered an essential approach for effective student learning of design thinking concepts. Design studio pedagogy is project -based and functions as a mentorship between tutors and students (Milovanovic & Gero, 2020; Cenani & Aksoy, 2020). However, even though the students gained completely different experiences in their actual studios on campus until before the pandemic, the learning experiences of the new generation and the methods of accessing education materials have now become very different / changed. Both outside and inside the classroom, and sometimes even in lessons, they experience learning and socializing on online networks. Therefore, it is not just the format of education that is changing today. At the same time, the students have also changed. They are more mobile and spend more time online than academics do, especially in the last two decades. Nowadays especially, they seek more flexibility and want to work as they prefer. On the other hand, by academics; particularly those who continue giving their design courses with their commitment to the traditional face-to-face education model; this process of change has been constantly ignored. Hence the fact that the actual studio environment is an integral component of design - although both actual and online studio environments offer some distinct and some common experiences for learning - was considered an absolute truth until the COVID19 pandemic era.

The first experiments with remote design collaboration began in 1988, the first major online design studio was established in 1992, with the name of Remote Collaboration between the students of University of British Columbia (UBC) and Harvard University. In 1995, two large virtual design studio projects were realized. The first was an international virtual design studio, which was carried out with the participation of students from Cornell University and MIT in the USA, ETH Zurich in Switzerland, UBC, University of Singapore, and the University of Sydney in Australia. Although online studio experiences have been within design education's field of interest, with various collaboration practices since 1988, mainly a distant and conservative approach against online studios was exhibited until the pandemic.

In fact, although there have been many applications on online studio training for a long time, mostly the academic side of design education believed that online studios would be ineffective and/or inefficient. The issue was that online studio platforms will inhibit efficient student-teacher interaction especially during transition from sketch to technical drawing, from model to prototype, and was the focus of discussion for years. With the pandemic starting almost in the middle of the spring term in 2020, the transition to online education; although it has been a rapid and unprepared one; opened the door to new experiences for design academics as well as students. This sharp bend mainly affected the implementation processes of one-on-one lessons, just like the design studio, which we define as the heart of design education. Moving actual studio spaces, where this process has been structured face-to-face for years, to virtual studio spaces, has evolved the dimension of long-standing debates from verbal discussions to practical experiences. It has also paved the way for different interface solutions to be found / used for the educational components of the design of the process.

Today, the world faces new challenges. Designers are starting to play a larger and larger role in not only designing but managing beyond the design studio and even deciding upon the activities that need to be done across the business. Our concern is that design education has not kept up with the new demands of the 21st century. We know today that the codes of the new century require designers to create value(s) for the industry. The aim of this study is to share the experiences and the collaborations carried out within the sector during the pandemic period, in a graduation project which is focused on university-industry cooperation - in order to make the role of the designer in the sector more effective, to transform education into a comprehensive sectoral experience for students and to offer the sector the experience of working with the designer - at Eskisehir Technical University, Department of Industrial Design.

INDUSTRIAL DESIGN PROGRAM OF ESKISEHIR TECHNICAL UNIVERSITY

The university is the main institution of the higher education system. Universities provide fully trained skilled persons, who will be used as the fundamental input of the entire innovation process. The university is the most appropriate place for critical thinking, problem-solving, developing technical and professional skills, and coordination with programs and institutions where innovations are nurtured. Moreover, combining the knowledge-based production and competencies of universities in the field of human resource training with the competencies of the industry in production and technology is very important in terms of introducing innovative and value-added products for the national economy. While design-oriented studies/projects in these collaborations enable the students to combine their theoretical knowledge with practical skills, at the same time they create an environment for the industry to produce design-oriented innovative products. Design and technology are the primary links that connect these two structures.

Since university-industry collaborations are linked to knowledge and technology transfer, these cahoots are important areas of collaboration for universities, industry and country economies. There are different models built with the cooperation of science and technology. These models undertake pioneering roles, especially for the new university-industry collaborations of the 21st century. First of all, inventions and innovations are of paramount importance for both the national and the international competitiveness of the industry. Design is an important key in demonstrating these added values. Cooperation between Universities and Industry includes collaborative research, research contracts, or scientific consultancy, the results of which are put into practice—in a process comparable to technology transfer for commercialization purposes—by more researchers (Perkmann et al. 2013; Leydesdorff et al. 2014; Berbegal-Mirabent et al. 2015). The effectiveness of research and development (R&D) investment depends on interactions between local companies and institutions in the scientific and technological system. When this interaction becomes progressively more active, R&D investment by companies, universities, and research institutes has a stronger effect on the construction of regional innovation systems (Etzkowitz and Klofsten 2005; Jiao et al. 2016).

While all this progress is taking place and as we experience the fourth industrial revolution, especially in Turkiye, universities and industry are still at a distance from each other. The industry/sector, which is skeptical of universities and design education, on the other hand, expects the design education that it is not involved in and does not support to give a reflex to meet the needs of the industry. Moreover, universities keep away from technology/production. In fact, the university's production of information and solutions together

with the industry accelerates the commercialization of knowledge and increases its widespread influence. Therefore, there is no doubt that the experiences students will gain, in university-industry collaboration projects, will make a significant contribution to their professional business life after graduation. In their graduation project, the students aim is to gain these competencies, especially from the 6th week of the project course, to experience design and production relations in real-time and real space. This process is a simulation of the design and production processes that students will experience in the sectors they will work in after graduation. In the 2020-2021 Spring semester, however, the education process planned within the steps and to be shared in the next section stopped on the 13th of March 2020 due to the Pandemic and moved from face-to-face education to online education platforms.

In the design-oriented graduation / university-industry collaboration project, which is the subject of this study, the process of transforming a creative idea into a commercial product by sharing the knowledge, experience, and production environments of the stakeholders, which is already challenging as a university-industry collaboration project, the interruption experienced due to the Pandemic, reconstruction, experiences of the stakeholders in engagement and remote cooperation, reflexes developed and results achieved are addressed.

DESIGN EDUCATION AND STUDIO CULTURE

The ENT452 coded Product Design VI course, which is given in the spring term of the 8th semester in Eskisehir Technical University, Department of Industrial Design, was designed as a graduation project. The graduation project is a compulsory eight-hour design project course based on university-industry collaboration, in which each student performs product design during the spring semester which covers 14 weeks. In this process where the transition of a creative idea to a commercialized product prototype is experienced, the student, the academic supervisor and the company mentor work together in coordination.

For the graduation project, the Department of Industrial Design aims to enable the student to experience the product development process in the current production environment; by choosing the sector he/she is interested in, and depending on the sector, the company he/she will work together with; before starting his / her professional business life, and to enable him/her to plan the product design process himself/herself and to gain the experience of the professional business environment in industrial product design before graduation. Before taking the graduation course, the students take the 7th-semester compulsory course, Professional Relations and Project Management, which is given in the fall semester at the Industrial Design Department. In the course, students make sectoral analyzes, learn about project management, and prepare a brief so that they can determine the company they want to work with. At the end of the course, they determine the company they will work with for the graduation lesson, sign cooperation agreements, prepare the project brief and project time management chart. Before the spring semester, students are expected to complete their preliminary sectoral research and submit a written brief summarizing possible project subjects with the company they will work with. Students who cannot complete the company agreement within this period are given extra time until the beginning of the fall semester.

A system consisting of three parties, i.e., an academic supervisor, a company mentor and a student, work in an integrated manner during the semester, for determining the project subject, conducting the design research, product development stages, solution of technical details until project ideas become 3D designs. Students should meet at least 7 times within 14 weeks with the companies they run their projects with and prepare meeting reports which will then be submitted for the approval of the academic advisor. The graduation project started on 3 February 2020, according to the Academic Calendar of Eskisehir Technical University. After the interim between March 16 and April 5 due to the Covid-19 outbreak, with the decision of the Council of Higher Education, the course reached an end with the online final evaluation juries held between 22-26 June 2020.

The graduation project course was basically designed, developed, and conducted to include 5 components.

1. Online communication and learning management platform: As information and communication tools for students in the process, a WhatsApp™ group with students and academic supervisors and an account opened for the course on Google Classroom™ have been used.

2. Face-to-face studio meetings: Academic supervisors communicate with their students via WhatsApp groups that they have established for fast communication and they share Zoom links for their online studio calls which they hold during and outside of class hours. This led to critical face-to-face sessions, one of the most important elements of the studio culture, to be continued online.

3. Company meetings: Documents such as weekly company meeting reports and research reports were received via Google Classroom. At the beginning of the semester, the formats of the company meeting reports had been determined and an assignment was created for every report on Google Classroom. The assignments are scheduled to be published every week on Google Classroom and have time limits (deadlines), i.e., they only become visible in the system when the time comes, and students upload their reports within the specified hours. Students held meetings with company representatives via online environments such as e-mail, video calls and Zoom meetings, and instead of submitting the reports with wet signatures as they had done before the Covid-19, they uploaded e-mails and Zoom meeting screen captures as attachments.

4. Reporting of design research: Students submitted the drawings, sketches, 2D and 3D rendered images of their works which they plan to present/discuss during the online joint jury evaluation, in suitable formats such as MP4, PDF, PPT, or JPEG, via Google Classroom at the delivery date/time determined according to the academic calendar.

5. Joint jury evaluations: A document addressing the submission criteria was prepared and shared as a pdf file on WhatsApp groups and Google Classroom, so as to guide the students in the joint jury evaluations. An empty draft program of the 4-day jury was arranged according to each of the project supervisors' groups and with a time slot for each student created via Google Spreadsheets and was shared on Google Drive (with the option "Anyone with the link can edit"). The link to the draft program was shared with the students via Whatsapp. Students added their names to the time slots they deemed appropriate in the lists. The program prepared by the academic supervisors and assistants in the pre-Covid period was now reorganized according to the time intervals preferred by the students in this period. A Google Sheets file opened on Google Drive and was shared with the project supervisors with the option "Closed-Certain people can access", which served as a grading list for the project supervisors to make joint grading.
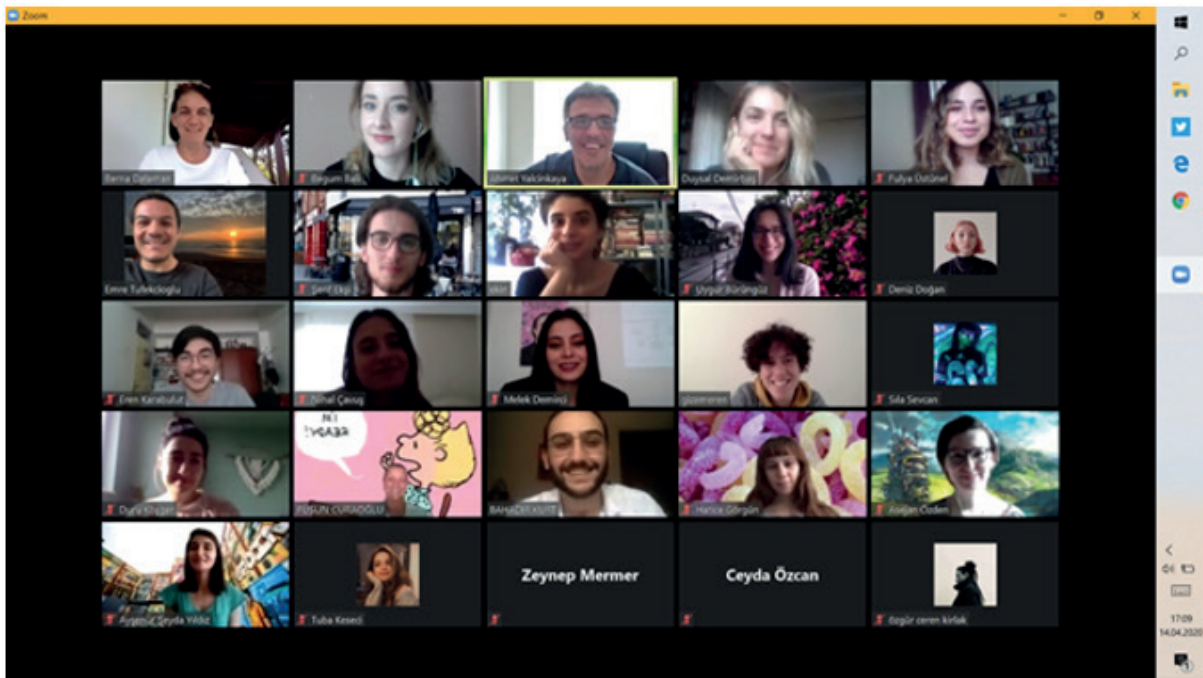
Figure 1. Zoom meeting

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RESEARCH METHOD

The method of this research is a case study, which is a mainly qualitative research method aimed at exploring the experiences and perceptions of students, academic supervisors and company mentors towards distance education within the scope of the online graduation project course, which is transitioned with emergency distance education. However, both qualitative and quantitative data can be used in a synchronous fashion in the case study, to illuminate a particular situation. The online course, which is considered in the context of the research, was examined by designing it with a holistic single-case design since it is a single, representative, and typical case, but also has not been reached before. In the case study presented here, the research group consists of the students who were enrolled in the 2019-2020 spring term graduation project course, academic supervisors and company mentors. The graduation project course was conducted with a total of 76 students, 6 lecturers and 54 mentors from different industrial design companies. A total of 42 students, 22 company mentors and 6 lecturers (academic supervisors) participated in our survey research. 69% (n = 29) of the students are females. In this group, seven of the participants have taken online courses before. 55% (n = 12) of the company mentors are female and 45% (n = 10) are male. Among the 22 company participants, 7 (32%) had done online project consultancy before. 4 (67%) of the academic supervisors are female and 2 (33%) are male. Apart from 1 faculty member, other faculty members do not have previous online course experience.

Online questionnaire consists of dimensions such as technology and physical facilities, learning, learning support, and emotional dimensions, students' adaptation and supervising. The questionnaires developed by researchers are used to determine opinions of students, instructors and advisors about the effectiveness of an online design studio course. To ensure the content validity of the questionnaire, we consulted the opinions of 4 experts on the items. Cronbach's Alpha internal consistency coefficient is calculated to determine the reliability of the questionnaire. Reliability coefficient of scale was 0.78 for the questionnaire. The internal consistency was assessed by calculating Cronbach's alpha coefficients categorized as adequate, 0.70–0.79 (Cortina, 1993). Qualitative data were obtained from 6 students and 4 company mentors with whom research was carried out, from focus group interviews. The purpose of the focus group meeting is to obtain the perspectives, experiences, tendencies, perceptions, attitudes, thoughts and feelings of individuals about a subject in detail (Krueger & Casey, 2014).

FINDINGS

Findings of the Students

The student's survey consists of four dimensions (Technology and physical facilities, learning, learning support, and emotional dimensions) to understand student centered experiences. A total of 42 students participated in our survey research. The students' devices that were used are listed as graphic tablet (%26,2), tablet (%23,8), desktop computer (%9,5), smart watch (%2,4) for an online studio course. Mostly the students preferred to use laptops (%95,2) and smartphones (%78,6) to access the online studio course.

It is asked to students that which tools they use for the course and for what purpose. The students prefer mostly WhatsApp and Zoom in order to effectively meet their online studio course requirements. WhatsApp is used more often by participants to send screenshots (%65), text messages (%75), digital models (%50), 2-D image (%78), and 3-D image (%50). Zoom is used mostly by them to send video calls (%98), screenshots (%70), digital models (%76), 2-D image (%83), and 3-D image (%73). E-mail is the other interaction tool used less frequently by students, especially to send text messages (%79), digital models (%61), 2-D image (%82) and 3-D image (%61). Nearly all of the participants used their own computer during the pandemic (%95,2). However, many of the participants shared their room with family members (%78,6). Eskisehir Technical University supported them with computers during the pandemic.

Table 1. Students' views on the environmental conditions in which they live

Statements	N	x̄	s
• The place I stayed was suitable for me to carry out the design process.	42	3,07	1,135
• Due to the design process, I did not have to go outside the house	42	2,05	1,188
• The place I stayed was suitable for online classes and meetings (in terms of privacy, noise etc.)	42	3,33	1,373
• The place I stayed was suitable for me to produce 3-dimensional models.	42	2,45	1,329
• I could easily access mock-up, model materials.	42	2,00	1,230
• I made my models at home	42	3,69	1,334
• I got my prototype done in a workshop.	41	2,78	1,782
• My company made my mock-up and sent it to my address.	42	2,02	1,660
• My company made my prototype and sent it to my address	42	2,71	1,642
• I could easily communicate with my company during the prototype process (transferring technical details, etc.)	42	3,02	1,137
• My prototype matched my design suggestion.	42	3,62	1,229
• My company delivered the necessary materials for the prototype	41	1,73	1,304

The students' views on the environmental conditions in which they live in are given in Table 1. The findings show that "they made their models in their home" ($\bar{x}$=3,69, s=1,334), and their place was suitable for online classes and meetings (in terms of privacy, noise etc.) ($\bar{x}$=3,33, s=1,373), and they could easily communicate with their company during the prototype process (transferring technical details, etc.) ($\bar{x}$=3,02, s=1,137). However, the participants don't believe that their company delivered the necessary materials for the prototype ($\bar{x}$=1,73, s=1,304) which is, normally, part of the university-industry collaboration agreement.

Table 2. Students' views on their use of technology

Statements	N	x̄	Ss
• Academic consultant / studio tutor / project supervisor had full knowledge of the necessary technologies and applications for the online environment	42	4,21	0,898
• I had full knowledge of the necessary technologies and applications for the online environment	42	4,36	0,727
• I have been informed about which technologies and applications I should use	42	3,83	0,881
• I was able to access reliable communication software / tools (e.g. Zoom, Google Classroom, Whatsapp, Miro).	42	4,57	0,501
• I was able to access reliable internet / service	42	3,95	1,035
• I was able to access a reliable / capable digital device (e.g. laptop, mobile device)	42	4,01	1,093
• I could access specialized software (e.g. Adobe products, Rhinoceros, SolidWorks, Autocad)	42	3,50	1,274
• I could access specialized hardware (e.g. wacom tablet)	42	2,64	1,462
• I was able to access online databases and online library resources	42	3,24	1,100
• I was able to access online collaboration tools (e.g. miro)	42	3,64	1,358

Table 2 shows the findings of the Students' views on their use of technology for the online studio course ($\bar{x}$=4,57, s=0,501), The participants highly believe that they can use the technology for academic consulting ($\bar{x}$=4,21, s=0,898), for getting knowledge ($\bar{x}$=4,36, s=0,727), for getting information about the technology ($\bar{x}$=3,83, s=0,881); for accessing the internet ($\bar{x}$=3,95, s=1,035), digital devices ($\bar{x}$=4,01, s=1,093), specialized software ($\bar{x}$=3,50, s=1,274), online databases and online library resources ($\bar{x}$=3,24, s=1,100) as well as online collaboration tools ($\bar{x}$=4,36, s=0,727). However, they could not access specialized technology such as wacom tablets ($\bar{x}$=2,64, s=1,462).

Table 3. Students' views on learning problems they experienced

Statements	N	$\overline{x}$	s
• I was able to attend the synchronous (online) lessons actively/regularly.	42	3,98	0,924
• Clear guidelines on project expectations/design tasks were shared.	42	3,60	1,211
• I had difficulty following the work schedule determined by academic supervisors	42	2,98	1,179
• The number and frequency of classroom work was sufficient.	42	3,69	0,975
• I was able to successfully manage the remote project execution process	42	3,69	0,975
• I was able to get adequate / appropriate feedback from the academic supervisors	42	3,36	1,100
• I was able to get interactive critics on my product sketches.	42	3,76	1,008
• I was able to get interactive critics on my product mock-ups.	42	3,33	1,162
• I was able to take interactive critics on three-dimensional digital drawings.	42	3,83	0,935
• I was able to have enough meetings with my academic supervisor.	42	4,07	1,135
• My meetings with my academic advisor were productive.	42	3,90	1,078
• I could easily reach my academic supervisor.	42	4,10	0,983
• I could not find personal motivation to complete the given design tasks (weekly sketches, mock-ups, etc.).	42	3,45	1,087
• During the lesson, I had difficulty continuing to work on my own project with the camera (Zoom) on.	42	3,52	1,110
• Being able to follow the critics given to my classmates made a positive contribution to my process.	42	3,45	1,173
• The critical implementation provided with the appointment system (via google drive) contributed positively to my process.	42	3,36	1,284

Students' views on learning problems are given in Table 3. According to their views, they can easily reach their academic supervisors ($\overline{x}$=4,10, s=0,983), have enough meetings with their academic supervisors ($\overline{x}$=4,07, s=1,135) and attend the synchronous (online) lessons actively/regularly ($\overline{x}$=3,98, s=0,924). Also, they believe that they can take interactive critiques on three-dimensional digital drawings ($\overline{x}$=3,83, s=0,935). It is said the students are highly positive about their academic supervisor's performance. However; most of students have difficulty following the work schedule determined by the academic supervisors ($\overline{x}$=2,98, s=1,179).

Students' views on the problem of communicating with the company are listed in Table 4. They believe that their mentors are productive ($\overline{x}$=3,67 s=1,223), and they can do interactive critiques on their product sketches ($\overline{x}$=3,67, s=1,074) and receive interactive critiques on three-dimensional digital drawings ($\overline{x}$=3,67, s=1,097) as well as report conversations from their company mentors ($\overline{x}$=3,60, s=1,106).

Table 4. Students' views on the problems they experience in communicating with the company

Statements	N	$\overline{x}$	Ss
• I could easily reach my company mentors	42	3,24	1,284
• I was able to have enough meetings with my company mentor	42	3,26	1,363
• My meetings with my company mentor were productive.	42	3,67	1,223
• I was able to receive interactive critics on my product sketches from my company mentor	42	3,67	1,074
• I was able to receive interactive critics on my product mock-ups from my company mentor.	42	3,17	1,267
• I was able to receive interactive critiques on three-dimensional digital drawings from my company mentor.	42	3,67	1,097
• I easily reported the conversations I had with my company mentor.	42	3,60	1,106

Students' views on their concerns are shown in Table 5. The students' concerns are typically centered upon presenting their three-dimensional design models such as a model/prototype in the evaluation juries in the most appropriate way ($\overline{x}$=4,64 s=0,727), internet-related problems during final delivery ($\overline{x}$=4,60 s=0,939), and completing three-dimensional design models such as mock-ups/prototypes ($\overline{x}$=4,40 s=0,885). Students' secondary concerns focus on not being able to see classmates ($\overline{x}$=3,21 s=1,440, getting high marks (scores) ($\overline{x}$=3,24 s=1,206, taking attendance / absence / class attendance ($\overline{x}$=3,12 s=1,014).

Table 5. Students' views on concerns about emergency distance education

Statements	N	$\overline{x}$	Ss
• Getting high marks (scores)	42	3,24	1,206
• Performing well in the classroom	41	3,54	1,247
• Changes in grading structures (e.g. successful/unsuccessful, with/without credit)	42	3,74	1,014
• Concerns about taking attendance / absence / class attendance	42	3,12	1,310
• Changes in the final (expected) delivery criteria	42	4,38	0,882
• Changes in the final jury evaluation criteria	42	4,26	0,989
• Internet-related problems (large file size, upload time, internet interruptions, etc.) during final delivery.	42	4,60	0,939
• To present three-dimensional design models such as model-prototype in the evaluation juries in the most appropriate way.	42	4,64	0,727
• Inability to perform adequately in remote / online jury evaluations	42	4,21	1,116
• Completing three-dimensional design models such as mock-ups/prototypes.	42	4,40	0,885
• Not being able to see classmates	42	3,21	1,440
• Not being able to communicate with the Project Supervisors	42	3,83	1,228
• Possible delays in finishing / completing the education program	42	4,02	1,115
• Missing out on extracurricular/on-campus activities	42	3,95	1,188
• Online privacy protection of personal data	42	3,26	1,345

Findings of the Companies

The company mentors' survey consists of four dimensions (technology, students' adaptation, supervising, emotional dimensions) established to understand industry-centered experiences in online education. A total of 22 company mentors participated in our survey research.

Company mentors prefer to use laptops (%90,5), smartphones (%76,2), desktop computers (%47,6), tablets (28,6) as technology to interact with students. They don't use smart watches and graphic tablets. Also, they use whatsapp (n=18), zoom (n=15), email (n=17) tools. One mentor prefers to use facebook messenger and google classrooms as a communication platform. Participants prefer to use mostly video call (%33), voice recording (%11), screenshot (%11), text messages (%28), digital models (%6), 3D image (% on whatsapp platform. 95,5% of mentors have a suitable place for online class and meetings (in terms of privacy, noise etc).

According to mentors' technological and physical facilities findings, it was observed that 15 mentors have their own desk and space during pandemic. 13 participants stay at their own house, 11 participant work from home, 10 participants work mostly in the company, 13 participants use their own computer, 1 participant share a room with a family member, and 1 participant stay at the relative house during the pandemic.

Table 6. Company mentors' opinions on the use of technology

Statements	N	$\bar{x}$	Ss
• Academic consultant / studio tutor / project had full knowledge of the necessary technologies and applications for the online environment	22	4,27	0,456
• I had full knowledge of the necessary technologies and applications for the online environment	22	4,32	0,477
• I have been informed about which technologies and applications I should use	22	3,59	1,297
• I was able to access reliable communication software / tools (e.g. Zoom, Google Classroom, Whatsapp, Miro).	22	4,59	0,590
• I was able to access reliable internet / service	22	4,41	0,666
• I was able to access a reliable / capable digital device (e.g. laptop, mobile device)	22	4,55	0,596
• I could access specialized software (e.g. Adobe products, Rhinoceros, SolidWorks, Autocad)	22	4,23	1,193
• I could access specialized hardware (e.g. wacom tablet)	22	3,00	1,512
• I was able to access online databases and online library resources	22	3,59	1,221
• I was able to access online collaboration tools (e.g. miro)	20	3,70	1,218

Table 6 shows the findings of the company mentors' views on their use of technology for the online studio course. The participants believe very highly that they can access; reliable communication software/tools (e.g. zoom etc) ($\bar{x}$=4,59, s=0,590), and a reliable / capable digital device (e.g. laptop, mobile device) ($\bar{x}$=4,55, s=0,596), reliable internet/service ($\bar{x}$=4,41, s=0,666), specialized hardware ($\bar{x}$=4,23, s=1,193). They trust themselves highly to technology knowledge for the online environment ($\bar{x}$=4,32, s=0,477), and academic consultant technologies for the online course ($\bar{x}$=4,27, s=0,456).

Table 7. The opinions of the company mentors regarding the education problems experienced during the emergency distance education transition process

Statements	N	$\bar{x}$	Ss
• I was able to participate actively/regularly in synchronous (online) meetings.	20	4,30	0,865
• I was able to successfully manage the remote project execution process	20	4,40	0,598
• I was able to give adequate/appropriate feedback to students	20	4,30	0,733
• I was able to give interactive critiques on students' product sketches	20	4,25	0,550
• I was able to give interactive critiques on students' product mock-ups	20	4,00	0,725
• I was able to give students interactive critiques on three-dimensional digital drawings.	20	4,25	0,786
• I was able to have a sufficient number of meetings with the students.	20	4,45	0,510
• Our meetings with the students were productive.	20	4,45	0,510
• I could easily access the students.	20	4,45	0,605
• I could easily communicate with academic supervisors.	20	3,60	1,046
• I was able to have a sufficient number of meetings with the academic supervisors.	20	3,45	1,050
• Our meetings with the academic supervisors were productive.	20	3,75	0,967

It is visible from Table 7 the findings of the mentors' views on problems for the online studio course. The mentors believe very highly that their meetings with students were productive ($\bar{x}$=4,45, s=0,510), they can access the students easily ($\bar{x}$=4,45, s=0,605), and they have sufficient number of meetings with students ($\bar{x}$=4,45, s=0,510). Moreover, mentors' opinion is that interaction between academic supervisors and mentors is sufficient but it can be improved ($\bar{x}$=3,45, s=1,050).

Statements	N	$\overline{x}$	Ss
• I was not familiar with online apps/tools or not comfortable using them	22	1,82	0,958
• I had limited knowledge of online meeting options	22	1,95	0,950
• I had limited personal time or energy to adapt to the process	22	2,36	1,049
• My personal preference is face-to-face consulting	22	3,32	1,041
• In this environment, I was not sure about the department's expectations from the company mentors	22	2,55	1,011
• In this environment, I was not sure about the department's expectations from students.	22	2,68	1,211
• Students were not responsible/sensitive enough.	22	1,82	0,733

It is seen in Table 8 that the findings of the mentors' views on online learning adoption. They believe highly that they are comfortable using online apps/tools and have knowledge of online meetings. They have an intention that their face-to-face consulting but is not highly ($\overline{x}$=3,32, s=1,041).

Table 9. Company mentors' opinions regarding their concerns about transition to emergency distance education

Statements	N	$\overline{x}$	Ss
• Deterioration (decrease) of student performance	20	2,95	0,999
• Inability to communicate with students	20	2,86	1,082
• Making prototypes of students	20	3,77	1,152
• Submission of students' prototypes	20	3,82	1,053
• Online privacy, protection of student data	20	3,05	1,290
• Online privacy, protection of my personal data	20	3,24	1,221
• The adequacy of my consulting performance	20	3,05	1,133

Table 9 shows the findings of the mentors' concerns on the online studio course. According to company mentors, the most concern is for students to make and submit prototypes ($\overline{x}$=3,77, s=1,152; $\overline{x}$=3,82, s=1,053).

Findings of the Academic Supervisors

The academic supervisor survey has four dimensions (technology, students' adaptation, supervising, emotional dimensions) to understand online education experiences. Six lecturers participated in our survey research.

Academic supervisors prefer to use laptops (%100), smartphones (%83), desktop computers (%33), tablets (33) as technology to interact with students. They don't use smart watches and graphic tablets. Also, they use whatsapp (n=5), zoom (n=5), email (n=6), google classroom (n=5). One advisor prefers to use facebook messenger and Instagram chat as a communication platform. Participants prefer to use mostly video call (%60), voice recording (%60), screenshot (%80), video recording (%40), text messages (%100), digital models (%40), 2D image (%80), 3D image (%40) on whatsapp platform. All supervisors use video call on zoom as a communication platform, and also send students text messages on whatsapp, facebook messenger and Instagram chat. 5 mentors except 1 mentor have a suitable place for online class and meetings (in terms of privacy, noise etc).

According to supervisors' technological and physical facilities findings, it was observed that all 6 supervisors have their own desk and space during the pandemic. Three supervisors stay at their own house, one participant works from home, 5 participants work mostly in the university, 6 participants use their own computer, 2

participants share a room with a family member, and 1 participant stays at the relative house during the pandemic. All supervisors believe that they can access reliable communication software/tools, internet and capable digital devices and specialized software as well as they know the use of online technologies and tools. Also, all supervisors believe that they attend the synchronous (online) lessons actively/regularly, successfully manage the remote project execution process, give adequate / appropriate feedback to the students, have enough meetings with my students, and easily reach my students. Also, in their opinion, their meetings are very productive and their critiques are efficient.

All supervisors think that they are comfortable using online applications/tools, and they are sure about the department's expectations from the academic supervisor. However, four supervisors have limited personal time and energy for online education and prefer to use face to face consulting. One supervisor believes that he/she has limited knowledge on online learning and department expectations from students. Also, according to one supervisor, students have not enough responsibilities to meet online learning course needs. Besides, the most concerns of academics are to decrease student performance and evaluate of their teaching activity.

QUALITATIVE ANALYSIS

Findings of Students

Another important evaluation made by the students regarding their individual learning processes was the negative effect on their own design processes is the interruption of peer learning during the pandemic. The fact that the features such as learning from each other, helping each other and feeling the class synergy, which take place in their natural flow in the studio environment in face-to-face-formal education, were not effective enough in the online environment, were described as a major deficiency by the students. The students who participated in the interview stated that the process was even more difficult especially for their classmates who were alone at home. One of the students expressed the result of the lack of face-to-face communication as follows: "It was not possible for the student to learn from the student. We were able to improve ourselves more in the classroom". Another student expressed the support she received from his classmates during the pandemic period as follows: "When we were alone at home, we could not create synergy. We continued the process by giving feedback to each other."

Students defined online critical sessions as an important problem, which includes difficulties such as accessing the teacher's meeting link, not being able to find a place in the appointment system or setting prerequisites for feedback sessions, instead of the physically open studio system that allows them to naturally receive feedback from other advisors other than their own academic advisor during the pandemic period.

All of the students who participated in the interview emphasized that face-to-face-formal education is very important especially in terms of feedback sessions. A student expressed the contribution of a critical session in which he had the opportunity to meet face-to-face with his academic advisor in the garden of the school as follows: "There were times when I could not understand the critics in their critical processes. Then when we met face to face, I suddenly understood."

Theme 1. Evaluation of the Process in Terms of Project Management

The students defined one of the important disadvantages of distance education as the difficulties they experienced during the production of 3D working models. Problems such as inadequacy of physical environment, inadequacy of materials and production tools were mentioned as an important problem by all students. One of the students expressed the problem he experienced as a result of the sudden change of city following the announcement of the bans; "There was no workshop, no space to make models, all of my materials were left in Eskisehir. I had a lot of problems during the modeling phase. In terms of company relations, being able to meet online was evaluated by the students with both positive and negative aspects.

The students stated that it is an important advantage to eliminate the financial burden created by the transportation and accommodation conditions that arise during the company meetings-visits that they must carry out during the term. Before the pandemic, four of the seven mandatory meetings were expected to take

place face-to-face and in the company. One of the students expressed the advantage of not having to go out of the city for a company interview as follows: "Since the company is in Inegol... We used to go to Inegol every week. The transportation cost was very high. This has provided significant convenience."

As another advantage, interview sessions in which both the company consultant and academic consultant and student come together were mentioned. One student expressed the advantage of this situation as follows: "If it were not online, it would not have been possible to have a joint meeting with the academic supervisor and the company mentor. This critique sessions have been very useful for me."

Theme 2. Opinions on the Online Environment and Tools Used

The students expressed the biggest advantage of the individual appointment system, which was created using Google Drive tools, as the ability to organize face-to-face academician -student meetings that extended in critical sessions. One student expressed the advantage created by this situation as follows: "I used to get in and out of the appointment system at my exact appointment time with the teacher. It was not a waste of time."

The technical problems experienced in the appointment system are expressed as follows: due to the publication hours of the appointment lists students cannot find a place for themselves, some students can make more than two appointments per week, allowing multiple entries to the same appointment time at the same time due to synchronization problems.

It is understood that there is a common opinion that this system has positive effects in terms of providing equal time and opportunity to everyone in the individual evaluation processes of the students, especially in jury evaluations. One of the students expressed this contribution as follows: "The time limit of online education enabled everyone to use equal time in the juries. It was a positive process that contributed to us."

All of the students who participated in the interview stated that they used different tools during the pandemic process. It is seen that the tools used are basically for two different functions. It has been determined that the first of these is the tools used in terms of process management, and the second is the tools used for interactive critique sessions.

Finding of the Company Mentors

All company mentors, who evaluate it regarding the communication dimension, define this new process as a disadvantageous process compared to the pre-pandemic period by saying "not like face-to-face". However, all of the company mentors stated that since student meetings were online, they could be organized faster and easier, and they could organize the participation of experts who will contribute to the meetings more easily. One of the company mentors stated the advantages of this process as "there was a time management advantage, there was no problem of catching up". In addition, another company mentor expressed the contribution of online communication tools and environments, which he/she saw as an advantage in terms of both communication and organization, as follows: "It was easier to include different human resources in the team".

All company mentors stated that they held meetings with students regularly every week, and that there were no problems, delays or postponements during the meeting days and hours. Mentioning that they experienced technical problems such as connection problems and sound problems during their meetings at the beginning of the process, company mentors stated that these problems became less frequent as the process progressed. All of the company mentors mentioned that they experienced similar difficulties in the learning curve of the process, and that there is a learning curve in using the new environment and the new tools that are used accordingly. A company mentor, who stated that finding the right communication environment and tool in the adaptation process is a natural part of the process, expressed her experiences in this process as follows; "We used Skype, (Microsoft) Teams, Whatsapp Web, Miro and Zoom, respectively. Finally, we started sharing screens via Miro and Zoom only".

A company mentor evaluated the design process which was carried out by one of the two students, whom she supervised, via drawing on a tablet instead of paper and stated that this made a significant difference in

the online process compared to the other student, and drew attention to the importance of the tools used in the process.

All company mentors stated that they assess the performances of the students in the adaptation process as positive. A company consultant pointed out emotion management as one of the important pillars of success in project management during this process stating; "Rather than using one's abilities, personal characteristics are effective; the one who manages the stress well, wins". Two company consultants stated that they experienced Miro, a remote interactive working platform, through students for the first time and continued to use it actively within the company.

They stated that the biggest disadvantage of the process in terms of communication is the evaluation of 3-dimensional working models during the project development process. Although more than one medium such as photographs, videos and video calls are used in the evaluation of 3D models, company mentors mentioned that they could not make an evaluation that would be sufficient to offer a product development proposal over models that they could not 'pick up and take a look'. One of the company mentors stated that "maybe we became distanced from experiencing via touching and seeing". Another company consultant, however, expressed his/her opinion on product critiques in the virtual environment as "We could not create a scale in the 3D part, I could not understand, I could not feel ..., choices such as fabric, color etc. were problematic because we could not meet face to face.

All company mentors stated that the students' inability to physically experience the company conditions/environment negatively affected the design processes. A company consultant expressed the positive contribution of the process for a student in Eskisehir who could come to visit the company within the framework of the measures taken according to the pandemic conditions by saying, "the student came by herself - this has been better/different of course"

One of the company mentors expressed the process of evaluating the final prototype as "Very troublesome and difficult. It was uncomfortable not to feel and not to see the scale". Another support that companies had difficulty in providing during the process was the delivery of the prototype, which is one of the most important elements of evaluation in the final jury. Due to reasons such as cessation of production activities, decrease in personal capacity, material supply problems, companies stated that they could not provide the prototype support this year, which they could offer in previous years. Another problem experienced in the prototyping process was that the final products which were produced by the students under their own conditions were not easily evaluated by the company consultants, as in the evaluation of 3D working models.

All company mentors who participated in the meeting expressed a common view that the graduation project should continue in a face-to-face manner, but they also approached the hybrid solutions positively due to their advantages in terms of time management.

RESULTS AND DISCUSSIONS

Due to the COVID-19 outbreak, face-to-face educational activities in higher education institutions were initially suspended; only to continue online after a while. The opportunities that online education has provided depending on time and place, i.e., flexible applications, came into play with surprising speed. This rapid transition process in the application-intensive and essentially one on one and face-to-face disciplines such as industrial design has enabled/created an environment for the discovery and application of different interface solutions and experiences. The results of the study show that Whatsapp and Zoom tools effectively meet students' (Students') online studio course requirements rather than e-mail to send videocalls, screenshots, text messages, digital models, 2-D images, and 3-D images. Similar to the results of the Ozguven et al. (2020), students found it positive to experience new communication tools in the study. The results also exhibit a strong tendency, among students, to use mobile devices like laptop computers and tablets instead of desktop computers even though most of them attended online classes without leaving home during the pandemic. The element that the students were most satisfied with was the formation of a communication triangle with the participation of the firm and the academic supervisor and allowing the participation of the technical support teams in the relevant meetings. These results show that the advances

in mobile device technologies which lead to flexible online communication and creation tools enabled Students experience an effective and creative communication chain with their supervisors and mentors. As Sonmez et al. (2018) stated, mobile technology enables users to access knowledge free from time and place constraints and is available for everyone regardless, to some extent, of income and level of education. With the onset of the pandemic, zoom was purchased and used under license by the University. It is predicted that the series of trainings and seminars organized by the university for the use of online learning tools, as well as the unlimited use of time and other tools obtained through licensed use, accelerate the adaptation process of academicians and students without interruption. As a result, all the parties of the online courses (academic consultant, learner and the company mentor) had full knowledge of the necessary technologies and applications for the online environment. A recent study by Hall et al. (2020) compares mobile learning approaches in six countries, namely United Kingdom, Australia, Belgium, Cyprus, Ireland and The Netherlands during the pandemic. The results show that what was done face-to-face before the pandemic was just carried online. The research conducted by Us (2021), it was found that the students prepared for the juries more easily, but had difficulty in getting critiques; however, it stated that the instructors are more involved than the face-to-face course. Our study on the other hand, shows that the students were able to get enough interactive critics effectively from their supervisors and mentors and also there were some enhancements on the process; i.e., the appointment system had a positive effect on Students' performances. The students' real concern gravitated towards presenting their three-dimensional design models in the evaluation juries, the most appropriate way. This concern is primarily related to shut down conditions during the pandemic and to safety precautions which the companies had to take to protect their employees. These conditions caused Students to not reach essential workshop facilities inside the companies which led to fear of making poor quality models.

There is no border to an interaction between stakeholders in online studio course, moreover, with the changes during the pandemic, time and budget management are more feasible for each and every party. Students can communicate interactively and get feedback from different perspectives from sector and university about their project by using online tools. Students' concerns are mostly about internet-related problems during final delivery and presentation of 3D design models to the jury. Inability to perform adequately in online jury evaluations is one of the anxiety points for Students. On the other hand, strict time limits, which is an integral part of online class and jury sessions, have strengthened the motivation of Students because they believe all peers had equal time limits and conditions. This supported their confidence in the process. Similarly, in the study conducted by Bingol (2020) it has been determined that a group of students in the Architecture Department encountered internet connection problems in the education process and this had a negative impact on their motivations. Disruptions experienced in the process of students accessing workshop facilities and production tools/methods, which are considered as the most important learning outcomes of the graduation project, have been identified as the biggest deficiency in the transition to online education. Due to the inadequacy of online tools in this regard, especially the problems experienced in the 3D prototyping process, getting consultancy (Bingol, 2020; Ozguven et al, 2020; Us, 2021), or working on a real model, etc. are seen as an important cause of anxiety for students.

For this, technological infrastructure may be strengthened for university students to not live with internet problems and virtual learning platforms should be developed for design education for the effective presentation of 3D models of prototypes. Thus, distance and face-to face education are not alternatives to each other. A hybrid studio education system is proposed for more qualified design studio courses.

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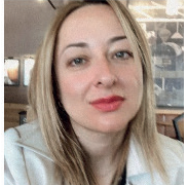
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SYNCHRONOUS VIRTUAL LEARNING STUDENTS' EXPERIENCE AND THE PROSPECT IN VIETNAM

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ABSTRACT

The purpose of the study was to examine students' learning experience with Google Meet, a virtual learning tool in tertiary contexts in Vietnam. The explanatory sequential mixed-methods design was used with the participation of 188 English as a Foreign Language (EFL) Vietnamese students at a private university in Vietnam. Findings from both the questionnaires and focus group interviews show that the students have a positive learning experience with Google Meet. Particularly, they perceive that breakout rooms in Google Meet enhance their interaction with their lecturers and peers and promote their sense of community in virtual learning classes. Additionally, the flexibility of virtual learning facilitates learners to solve learning-prevented problems, such as internet connection and power outage. Furthermore, blended learning is perceived as a highly preferred learning mode even after the pandemic. Based on the results, pedagogical strategies are implicated to maximize the effectiveness of virtual classes.

Keywords: Synchronous virtual learning, EFL, students' experience, blended learning, COVID-19.

INTRODUCTION

Teachers and students all over the world have experienced several waves of the COVID-19 since 2019. To deal with school closure, all school systems worldwide must abruptly shift from face-to-face classrooms to total online ones (Asian Development Bank, 2021). Likewise, the Vietnamese Ministry of Education and Training has approved to deploy an online learning platform to end the school closure period several times since May 2020. Although online learning is not a new term in education, which has been applied since the 1990s (Harasim, 2000), for the Vietnamese education system, full time online courses appear quite new. In fact, according to digital transformation policy in the period 2025-2030 approved by Vietnamese Government in June 2020, 100% of educational institutions offer distance learning programs and pilot teaching curriculum which have at least 20% online program (Government of Vietnam, 2020). Therefore, it is possible that such abrupt transfer may cause challenges for the whole system which is not ready to change (Dinh & Nguyen, 2020), which in turn possibly makes online learning during COVID-19 periods less effective (Asian Development Bank, 2021).

A plethora of studies have recently been conducted to gain insight into learners' difficulties in synchronous virtual learning in different learning contexts. Internet - related issues are the most popular problems that have been explored by Dinh and Nguyen (2020), Alolaywi (2021), and Dao and Ha (2021). In addition, Dao and Ha (2021) revealed the abundant obstacles faced by the learners, including geographical features, the economic status, culture and tradition, learner motivation, cost of internet access to the internet and

social interaction through their mixed method study with 1165 students at high schools and universities in the Mekong Delta in Vietnam. Another challenge is that students find it difficult to maintain their concentration on teachers' instruction (Alolaywi, 2021). Apart from the difficulties, several researchers found contradictions on students' perception toward online learning. Synchronous virtual online learning, on the one hand, benefits learners in terms of COVID-19 related problems and traffic problems avoidance, mobility, convenience, and flexibility (Alolaywi, 2021), 80% of students acknowledged the convenience of virtual learning, 66% of their participants satisfied with their virtual learning, and 60% were confident in joining online classes (Karim & Hasan, 2020). Synchronous virtual learning platform, on the other hand, emerges less attractive compared with face-to-face classroom (Alolaywi, 2021). Regarding the prospect of online learning, the results from related literatures provide a positive vision for online learning in the future (Karim & Hassan, 2020; Dao & Ha, 2021).

Noticeably, previous work has failed to address the role of the online learning platform. Activity theory proposed that tools we use play a significant role in shaping our experience, without knowing the role of the tools we can miss the opportunity to understand the activity (Nardi, 1996). In other words, to gain insight into learners' experience with a virtual learning environment, it is significant to know the roles of the virtual learning platform. Therefore, the purpose of the study was to investigate how EFL Vietnamese students experienced synchronous virtual learning through the roles provided with Google Meet. Particularly, the study addressed the following research questions.

1. What are the roles of virtual learning platform perceived by Vietnamese EFL learners?
2. From their experience, what learning mode do they prefer after the COVID-19?

LITERATURE REVIEW

Synchronous Virtual Learning Environment

Synchronous virtual learning environment refers to a form of online learning which is carried out through the real time interaction between students and teachers (Kaup et al., 2020; Racheva, 2018). In this sense, this form of learning is quite similar to a face-to-face classroom in the way that students and teachers have their meeting at appropriate time in accordance with the schedule. The only different feature is that every member in the classroom is in different locations while meeting. In this study, synchronous virtual learning refers to an online learning mode through an online learning platform which allows teachers and students to interact with each other in real time at different locations.

There are some popular virtual learning platforms such as Zoom, Microsoft Teams and Google Meet. On these platforms, participants are able to make and join in video and audio conferences. In this study, synchronous virtual classes are conducted on Google Meet with the features, including breakout rooms, hand raising, meeting recording, white boarding, text messages, and screen sharing.

The Roles of Synchronous Virtual Learning

Successful online learning should provide learners with interaction, a sense of community, flexibility, and usefulness for their learning (Palloff & Pratt, 2013). These aspects have been paid close heed by a plethora of researchers.

Interaction

Interaction is a vital factor in second language acquisition since learners can obtain input and constructive feedback from their peers to improve their knowledge (VanPatten & Benati, 2015). As a platform of learning, therefore, a synchronous learning environment is believed to be a place to enhance students' engagement (Sweetman, 2021). According to Moore (1989), there are three main types of interaction in online learning including interaction between students and content, interaction among students and interaction between students and teachers. These types of interaction are supported by the available tools on virtual learning platforms, such as video and audio, visual hand raising, small group discussion, chat, and white boarding (Sweetman, 2021). With the help of these available gadgets, learners in a synchronous

classroom environment are easy to express their opinions and listen to their classmates (Gedera, 2014). In several current related research, there have been several mismatched findings in terms of the role of interaction in synchronous classroom environments. Some researchers indicated that students experienced lack of interaction (e.g., Abbasi et al., 2020; Dao & Ha 2021) whereas others concluded that virtual learning enhanced learners' interaction (e.g., Aljuaid, 2021; Ironsi, 2021). Therefore, it is worth examining whether the virtual learning platform enhances student's interaction.

Sense of Community

A sense of community refers to the feelings of being and belonging that each member has within a group (Yuan & Kim, 2014). It is argued that distance learning may cause feelings of an isolation because it is very hard for students to build relationships and a sense of belonging when they have no peers to "measure progress against" and their teachers just move from lessons to lessons (Carrier et al., 2017, p.144). However, synchronous communication through virtual learning tools is considered one of the ways to enhance a sense of community in online learning because real time interaction allows questions to be responded simultaneously (McInnerney & Roberts, 2004). Apart from interacting in the whole class, students can work in pairs or groups in their own breakout rooms, which enables them to be more comfortable to socialize with their peers to complete their given tasks or give and receive feedback from each other (Carrier et al., 2017). To address the role of interaction in promoting learners' sense of community, Berry (2019) interviewed 20 students and analyzed more than 50 videos from online classes in a doctorate program. He concluded that synchronous virtual learning with the features of video call and text chat enhances students' engagement and sense of community. Additionally, collaborative learning strategies including group discussions and group projects are reported to possibly enhance students' sense of community because they can share learning experience with each other (Oliphant et al., 2016). In addition, a sense of community can be established by creating a positive learning environment through building positive relationships among members in the virtual learning classroom (Ratliff, 2019). Particularly, having discussions about any daily topics such as movies also helps to establish an ideal learning environment (McInnerney & Roberts, 2004). As a result, we hypothesize that virtual learning platform promotes students' sense of community, which is associated with the interaction and the quality of the learning environment.

Flexibility

Online learning is flexible, which allows learners to learn from anywhere and anytime (Palloff & Pratt, 2013). As a form of online learning, the synchronous online classroom environment provides students with the opportunity to learn from different geographical sites, without getting together in the same classroom like the face-to-face classroom. Hence, it saves students' cost of traveling (Aji et al., 2020) as well as commuting time (Thamarana, 2016). However, in synchronous learning, students have to follow a fixed schedule, so they are unable to choose the most appropriate time for themselves to study, which inhibits learners' ability to change their learning time themselves to avoid some common problems related to quality of internet access (Dinh & Nguyen, 2020; Mursyidin et al., 2021), and technical issues (Dahmash, 2020; Dinh & Nguyen, 2020). Although the lessons are synchronous, they are recorded and this makes learning flexible. Therefore, we hypothesize that the flexibility of synchronous learning facilitates students to overcome learning problems.

Usefulness

Virtual learning enhances learners' information and communication technology (ICT) skills and learning outcomes. According to research, online courses help learners improve their technological skills. For example, Aji et al., (2020) found that one of the benefits of blended courses is enhancing learners' ICT skills. Apart from ICT enhancement, Francescucci and Rohani (2019) concluded that a synchronous course could provide students with outcomes that are comparable to those from face-to-face learning ones after conducting their research on 698 learners. Their findings support Simonson's equivalent theory (1999) that a proper online course can provide online learners with equivalent experiences in learning to those in face-to-face classroom. However, this contradicts Adnan and Anwar (2020)'s result that online learning was less

effective than face-to-face learning in achieving learner's expected learning outcomes. However, it is noticed that Adnan and Anwar (2020) undertook their study when educational institutions were forced to suddenly switch their teaching mode to face-to-face instructions to online ones because of the outbreak of the global pandemic. This abrupt transfer is argued to possibly cause tremendous obstacles for student's learning such as lack of internet access and monetary issues (Adnan & Anwar, 2020). Consequently, the online learning in Adnan and Anwar (2020)'s context was ineffective regarding producing the desirable learning outcomes. In our current context where we were in the second year experiencing the pandemic which means we had more time and experience to better our online teaching practice. Hence, we hypothesize that the virtual online platform is perceived to be useful.

Theoretical Framework

Activity theory initially developed from the work of Vygotsky (1978) and subsequently extended by Leont'ev (1978) and Engestrom (1978). The underlying principle of the theory is to provide an insight into human activity with its social context. In the first generation, an individual activity includes three key components consisting of subject, object and the mediating artefacts (Vygotsky 1978) in which tools serve as meditators for the subject's accomplishment of the object (Nguyen, 2020). The original model was expanded with social contextual factors such as rules, community and division of labour in which rules are established by the community who takes responsibilities for assigning individual work or division of labour (Yakubu & Dasuki, 2021). In other words, these sociocultural factors affect the process of the subject's use of mediating tools to achieve the object (Nguyen, 2020). In this sense, these elements are interrelated and together make up an activity system which is considered as a basic unit of analysis (Engestrom, 2001) through which to understand human activity (Gedera, 2014). Throughout the generations of this theory, the role mediation of tool is a key component (Engestrom, 2000). In line with this, tools used play a significant role in shaping users' experience, so it is impossible to gain insight into our activity without knowing what roles of tool are (Nardi, 1996). The activity is widely adopted as a theoretical framework to examine the role of technology in the educational field (Bakhurst, 2009). In this regard, the study is shaped by this theory in the way that it highlights the role of digital technologies serving as a meditating tool by which participants use to achieve desired outcomes in social learning contexts (Bower, 2019). Particularly, we hypothesize that students can achieve learning outcomes such as interaction, a sense of community, flexibility, and usefulness by using Google Meet, as shown in figure 1. In this study, the components of Activity Theory refer to Google Meet (tool), students (subjects), learning tasks (objects), virtual classroom rules (rules), teachers and students (community), division of tasks (division of labour).
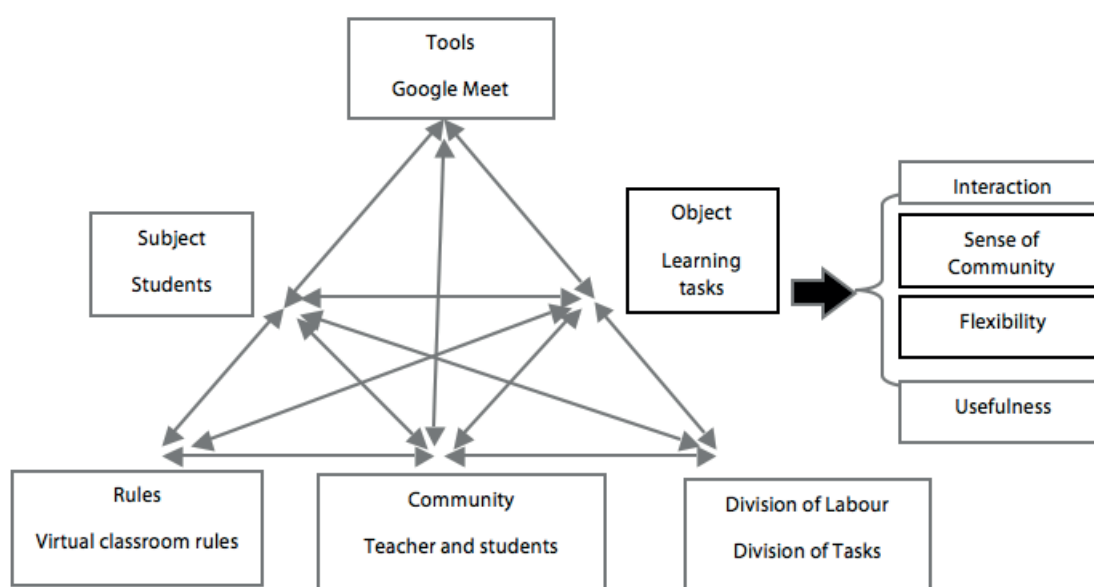
Figure 1. A proposed framework for this current study. Adapted from Engestrom (2002)

METHODOLOGY

Mixed Method Design

The study used the mixed methods design because it allows researchers to collect both quantitative and qualitative data, helping to reduce bias and subjective judgements (Creswell, 2009) and generate triangulating results (Williams, 2021). The explanatory sequential design in which quantitative data is collected first before qualitative ones was used in this study. By doing this, we can make sure that the quantitative data we acquire may be enhanced and expanded and then used to explain in a broad context by the qualitative data (Creswell, 2012). As a result, this design enables us to gain more in-depth insight into participants' views on their experience of virtual learning (Creswell, 2018; Williams, 2021).

Research Instruments

Two research instruments including a survey questionnaire and focus group interviews were used in this study. The first instrument was the questionnaire adapted from students' experience of features and characteristics of virtual learning questionnaire developed and validated by Parker et al. (2010). The face and content validities of the questionnaire were established by six experts including four instructional technologists and two survey research instrument constructors. Additionally, its reliability index and correlated factor index was 0.9 and 0.54 respectively (Parker et al., 2010). After considering 38 items from the original version, 15 items on features of virtual learning were removed as they did not meet our study's purpose. Additionally, two items related to technical problems and internet bandwidth were excluded because we would like to focus on the roles of the learning mode itself instead of objective obstacles. Then, we also changed the name of this factor from synchrony to flexibility. Likewise, the factor Usefulness was renamed from the original name Usefulness and Easy to Use to make it closely related to our research objectives. The participants were asked to rate their virtual learning experience on the 1-4 Likert scale, ranging from 4 = strongly agree to 1= strongly disagree. The questionnaire was translated into Vietnamese, participants' mother tongue language to make it comprehensive for the participants. The translated version was checked and proofread by our colleagues who have been teaching translation courses for more than five years. To ensure the reliability of the questionnaire, a pilot test was conducted with a group of 44 participants, a qualified number as suggested by Johanson and Brooks (2010), who stated that the minimum number of participants for the pilot test is 30. After piloting the questionnaire, four items including "My typing hindered me; I could not talk freely because I could not see my classmates face to face; I was not confident using the VC, and the class was monotonous" were removed as the Correlated Item –Total Correlations are below 0.3.

These respondents from the pilot test were excluded from the main study to ensure the quality of the research design (Haralambos et al., 2004). After removing disqualified items, the overall values are over 0.6 and the Correlated Item –Total Correlations are over 0.3, meaning that the questionnaire is qualified to collect the data (Creswell, 2018).

Table 1. Cronbach Alpha of each cluster in the questionnaire

Clusters	Cronbach's Alpha	N of Items
Interaction	.924	6
Flexibility	.864	3
Usefulness	.875	4
Sense of Community	.800	4

Apart from the 17 items, one open – ended question included in the questionnaire to shed light on student's preferred learning mode after the COVID-19.

In this study, an EFA with the Promax rotation was employed. 17 qualified items related to the features of virtual learning tools were loaded into four factors. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.846. Additionally, the initial eigenvalues were greater than 1, which is considered significant. Bartlett's Test is .000, meaning that all variables are correlated.

Table 2. Total variance explained

Components	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
Interaction	6.652	39.127	39.127
Usefulness	1.900	11.174	50.301
Flexibility	1.569	9.230	59.531
Sense of Community	1.155	6.793	66.325

Table 3. Pattern Matrix[a]

Components	Factors			
	1	2	3	4
Facilitated instructor to student Interaction	**.620**	.409	-.091	-.052
Facilitated student to student Interaction	**.860**	.168	-.164	-.040
The quality of class discussions was High	**.947**	.008	-.139	.005
I learned from my fellow students in this class	**.882**	-.057	.000	.039
Instructor frequently attempted to elicit student interaction	**.684**	-.245	.242	.066
It was easy to follow class discussions	.477	.240	.274	-.012
It reduced my travel time to the campus to attend face - to- face class	-.103	.100	**.892**	-.018
It reduced my travel cost	-.129	.147	**.901**	.006
It helped me collaborate with peers without having to be in the same location	.161	.029	**.713**	-.003
it enhanced my effectiveness	-.060	**.854**	.059	.037
It improved my performance	.000	**.791**	.113	-.005
It was easy for me to become skillful in using VC	.277	**.315**	.204	.099
I found it easy to get the virtual classroom to do what I want it to do	.189	**.591**	.125	-.082
I felt isolated	.224	-.210	.055	**.757**
There were not many collaborative activities	-.208	.325	-.155	**.755**
I did not feel a sense of belonging in the classroom	.026	.231	-.115	**.699**
I worked on my own for most of the projects	-.009	-.307	.216	**.611**

Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization. a. Rotation converged in 6 iterations.

The second instruments were focus group interviews that enable the researchers to gather a small group of participants to explore perceptions, feelings, and ideas about specific topics (Denscombe, 2010). In this sense, the participants are given the chance to argue and challenge each other's ideas, which compels them to think and possibly revises their perspectives (Bryman, 2012). Consequently, it provides realistic explanations about their experience of virtual learning. The interviews were undertaken after analyzing the data in the questionnaire aiming at seeking the participants' confirmation and detailed explanations regarding the clusters in the questionnaire. Therefore, the interview questions were created based on four clusters including interaction, usefulness, flexibility, and a sense of community. Particularly, sample questions include: What do you think of interaction (between you and your classmates; you and your lecturer), usefulness, flexibility and sense of community in your virtual classes? and do you want this virtual learning mode to be continued when the COVID-19 is decontrolled?

Participants

228 first-year students including 98 females and 93 males who took English preparation courses via Google Meet in a private university in the southwest of Vietnam participated in this study. Their age ranged from 18 to 20 years old. The students were from different majors. In the university, all first-year students are required to take English preparation courses before they study their major subjects. These participants

had experienced virtual learning through Google Meet, Zoom, Microsoft Teams when they were in high school because of the pandemic. They were selected using the convenience sample technique, which allows researchers to choose volunteers who have key characteristics related to the aim of the study (Airasian et al., 2009; Dornye & Taguchi, 2009). We applied this technique because we believed that when participants voluntarily participate in the study, they are more motivated and willing to share their experience of virtual learning, meaning that they would provide us with fruitful results. In terms of focus group interview, due to the pandemic, we conducted three online focus group interviews with six participants in each group, an appropriate number as advised by Denscombe (2010). We selected the participants based on their responses to the questionnaire that they were willing to participate in the interviews. Among 155 responses, we randomly selected 24 participants for the focus group interviews. Each interview took about an hour. The informants participated voluntarily in the research without any compensation. Their consent forms were obtained before they completed the survey and participated in the focus group interviews. In addition to this, a pseudonym was used to address each participant during the interview to protect their anonymity.

Procedure

The study comprised two phases of data collection. Firstly, an online questionnaire was sent to the participants via Google form at the end of the course in the Fall semester from September to December 2021. After removing faults or duplicated data, 188 responses (82.5 %) were qualified to be processed to SPSS to generate results. Secondly, after collecting the quantitative data, four focus group interviews including 24 voluntary students lasted about an hour to gain further explanation of their virtual learning experience.

Data Analysis

There were two phases of analyzing the data. Firstly, we used the IBM SPSS version 20 to run the descriptive statistical procedure and Exploratory factor analysis (EFA) to analyze the quantitative data. Secondly, we followed three analyzing steps including preparing and organizing the data for analysis, coding and condensing the codes, representing the data suggested by Creswell and Poth (2018), and adapted a thematic analysis to analyze the data of the open – ended questions from the questionnaire and the focus group interviews.

FINDINGS

In this section, we firstly report an overview of EFL Vietnamese student's experience of roles of virtual learning platform generated from the questionnaire and the focus group interviews. Secondly, we present students' preferable learning mode after the pandemic.

EFL Vietnamese Students' Experience of Virtual Learning Platform

Quantitative results as presented in Table 4 show that the participants had a positive experience of the roles of the virtual learning tool in virtual classes. Particularly, they rated virtual learning classes as flexible with the highest mean score (M = 3.4504; SD = .62567). Interaction was rated as the second feature (M = 3.3309; SD = .62745), which is followed by useful and easy to use (M = 3.1263; SD = .60716) and sense of community (M = 3.1090; SD = .66175) respectively.

Table 4. Roles of virtual learning platform

Features of virtual learning (N=188)	Mean	SD
Interaction	3.3309	.62745
Flexibility	3.4504	.62567
Usefulness	3.1263	.60716
Sense of Community	3.1090	.66175

Regarding the qualitative findings, the participants provided us with examples or explanations about the roles of Google Meet platform, namely interaction, a sense of community, flexibility, and usefulness. These findings are consistent with the quantitative results in the way that the students have positively experienced their virtual classes. The results, together with the quantitative results, offer significant insight into their experience. The aspects are presented as follows:

Interaction

The participants generally perceived that virtual classrooms enabled them to easily interact with their lecturers and peers. They could take their turns by raising their hand, talk by video calling function, write the messages on the box chat and work with their peers on Jamboard. For example, Hue, Vu, and Hau in Group 1 said,

> *"I preferred texting with friends through text chat."* - Hue
>
> *"I did lots of cooperative tasks on Jamboard and box chat."* - Vu
>
> *"I preferred making video call because it was quicker than chat"* - Hau

In terms of interaction with teachers, the majority of students said that their lecturers could assist their learning as much as in traditional classes because they could ask and receive directly their lecturers' explanations. As reported by the participants in group 4, in virtual classes, their lecturers could help them learn as in a face -to- face classes. Additionally, some students claimed that they found it easier to communicate with their lecturers in online classes. Hoa claimed, "*in virtual classes, every student had the same distance to their lectures, which means there was no front row or last row positions like in traditional face-to-face classrooms*". Similarly, An in group 3 said, "*It was easier for me to interact with my teacher in (virtual) class than in a (face-to-face) classroom because in a face -to- face classroom, teacher might not hear what students at the last rows said*". Regarding their interactions with the classmates, the students commented that they would interact with their peers better in the break-out rooms where there was a small number of students working in groups, compared to their interactions in the main room where the whole class studied together, which made them shy and afraid of making mistakes. All students in groups 1, 2, 3, and 4 respectively asserted that breakout rooms made it easier for them to freely talk with their peers as there were small numbers of participants who they understood well. Particularly, they said that

> *"I preferred interaction in the breakout room because we could communicate very well"* - Lan in group 4
>
> *"We worked well in our breakout room. We sang and we talked"* - Hue in group 1
>
> *"In the small room, we all interacted. It was more comfortable than in the main room. We were more confident".* - Phuc in group 2

It is noticeable that interaction was the most effective where they were able to work in harmony groups where they could work with those who were friendly, easy to get along well and open rather than those who were passive or had dominant behaviors. Trang in group 3 said "*I was sometimes randomized to a new group which was passive, I felt so unhappy*". In addition, Hong in group 2 added "*Once I worked with him/her, she/he sounded so aggressive, so I was scared and did not want to share any ideas with him/her*".

Sense of Community

The participants reported that virtual learning promoted their sense of community in the way that they were able to interact with classmates who were open and active. Dao in group 1 said that:

> *"Before starting or ending our classes, we turned on the microphone and talked. We shared our personal stories and discussed some issues from our lessons. We felt a strong connection and were happy to spend time with our classmates. However, we hoped that the others who were quite silent would be more active to join us."*

Similarly, Cuc in group 3 added "*I had a close-knit relationship with my classmates but not all of them. I could not communicate with some friends who were introverts [....] or whenever I joined class late, my close friends*

called me […] they cared for me." Similarly, Lam in group 3 commented "*Outgoing classmates could create a positive classroom environment.*"

The participants claimed that they had a greater sense of community in the breakout rooms rather than in the main room because they could interact with their favorite group members. Sang in group 4 recalled "*Breakout rooms could create our sense of community because it enabled all members in my group to interact together*". In line with this, Vu in group 1 reported "*In our breakout room, after we finished our task, we talked about our daily stories or shared our learning experience, so we understood each other*". Similarly, Kim in group 2 stated "*We usually chatted, watched movies and sang karaoke in our breakout room at break time*". However, the participants reported that they had a sense of community when they could work with their favorite peers. Ho in group 2 asserted "*I did not have the sense of community in both the main room and breakout room when I worked with peers who I was not compatible with. However, when working with my favorite friends, I felt this sense.*"

Apart from the breakout rooms, the participants claimed that their lecturers also played a significant role in promoting their sense of community in the way that they created a positive classroom atmosphere and reduced a sense of isolation. Tram in group 2 claimed "*My lecturer was friendly, enthusiastic, humorous, and caring […] she called us my darlings, which made us feel comfortable and engaged*". Hieu in group 3 also added "*My lecturer often called passive students to prevent them from having a sense of isolation.*"

It can be concluded from the extract that breakout rooms promoted learner's greater sense of community as they enabled them to interact with their favorite classmates. Additionally, lecturers were of significance in promoting student's sense of community.

Flexibility

The participants admitted that virtual classes were flexible as it allowed them to learn anywhere or view the recorded lessons. Trong in group 4 commented "*Thanks to Meet, we could learn from home and felt safe from COVID-19*". More importantly, students could solve their problems such as finding a place with better internet access. Sang in group 2 added, "*We could learn at any place with an internet connection. Once there was a power cut in my house, I went to a milk tea coffee nearby to study*". Additionally, students could find a place where they had better concentration for learning and escaped from distractions at home. Thanh in group 3 recalled "*I liked to go to a coffee shop near my house to study. In the coffee shop, there were people around that prevented me from falling asleep. Otherwise, when I studied at home on my bed, I could not help myself sleeping*". They could learn while waiting for being vaccinated, as reported by Luc in group 3 "*When I was scheduled to get vaccinated, I brought my phone with me to study so that I did not miss an important part of the lesson*". Similarly, they could re-study some missing lessons by self-learning from recording or having a meeting with their classmates or lecturers. Hung in group 1 stated "*When I could not join the class, I had some ways to catch up with the knowledge for that day by asking my friends to record the lesson, having meetings with my classmates or lecturers for tutoring*".

Usefulness

In terms of effectiveness the majority of the participants confirmed that the Meet platform was useful for their learning. For example, Hau in group 1 commented "*Meet was simple and easy to use. I loved Meet.*" They also reported that their learning was effective thanks to Meet. For instance, Giau in group 4 said that "*I felt fine to learn on Meet because it helped my learning easier*". In the same vein, Viet in group 3 said "*Meet enhanced my learning because it allowed me to record my lessons that I could easily use for my revision*". Hoa in group 1 added "*My lecturers could provide their lesson effectively. I found that my performance was much better through the courses on Meet. I was more confident in answering questions and solving difficult tasks*". Apart from the effectiveness, some students also reported the negative sides of this learning platform. Thien in group 3 said that "*Sometimes I could not concentrate on the lesson and my lecturers could not know whether I was learning or doing other stuff*". Similarly, Dao of group 4 mentioned that "*There were problems with internet connection and lecturers could not observe or manage students in class*".

Student's Preferable Learning Mode Post the COVID-19

Table 5. Student's selected choices of their preferable learning mode after the COVID-19

Preferable learning modes	N	% of respondents (N=188)
Synchronous online learning mode	34	18.1%
Face-to- face learning mode	117	62.2%
Blended learning mode	120	63.8%

Percentages of each learning modes were rated to show EFL Vietnamese student's acceptable learning mode after the pandemic. As shown in table 5, the most preferable learning mode was blended learning (63.8 %). Face-to-face learning closely stood as the second favorite one (62.2 %) whereas synchronous online learning mode was the least preference (18.1%). Qualitative results show that the students selected blended learning because of its effectiveness. Particularly, Dao in group 1 said "Blended learning could be more flexible as it could combine both online learning and face-to-face learning". Additionally, Son in group 4 claimed "Blended learning enabled me to change my learning environment, which made me feel more comfortable with learning [….] thus made me learn more effectively."

DISCUSSION AND IMPLICATION

Experience of Virtual Learning

Both qualitative and quantitative methods have been used to shed light into the Vietnamese students' experience of synchronous virtual learning on Google Meet platform in their Fall semester 2021. The general results recommend that the learners have been quite positive toward Google Meet. Specifically, Meet features provide them with the experience of interaction, sense of community, usefulness and flexibility.

The first important finding is that using the Meet platform can enhance the students' interaction with both their teachers and peers. However, there are differences in their interactions in the main room and breakout rooms. In the main room, the students are more satisfied with their interaction with their teachers than their peers because in the main room students are so quiet and internet-related problems sometimes occur, inhibiting students from interacting with one another. However, when working with their cohesive groups in breakout rooms, they are satisfied with their interaction with their peers. While our finding is consistent with Aljuaid (2021) who also found that virtual classes can enhance learners' interaction, it is different from Dao and Ha's findings (2021) that learners experienced lack of interaction in virtual classes. The possible reason for such inconsistency is the matter of time. For instance, Dao and Ha (2021) conducted their study in the time when both Vietnamese teachers and students just experienced online learning for about two months, which is believed to be way too sudden for them to prepare for the new style of learning and teaching. However, in our context, both teachers and learners have already experienced online teaching for approximately one year. In our study, the students accept that their online classes are interactive through the support of the available tools such as breakout rooms together with Jam board, hand raising and box chat.

As the aforementioned from the literature, there is the relationship between interaction and students' sense of community (Berry, 2019; Carrier et al., 2017; McInnerney & Roberts, 2004) In fact, the successful interaction among the members establishes the feeling of attachment among them. We found that the core factor for successful communication comes from the warm atmosphere students have with their classmates and lecturers, which is compatible with Ratliff's finding (2019). In addition, it is noticeable that breakout rooms, where students collaborate in groups, are the places where most students feel most comfortable working with their favorite classmates. This finding is in accordance with Oliphant and Branch-Mueller (2016) who concluded that working in groups could enhance students' sense of community because they could share things together apart from learning.

Regarding flexibility of virtual classes, we found that this nature characteristic provides students with benefits, such as saving time and money to travel from home to school and the flexible learning place, which are in line with Aji (2020) and Thamarana (2016)'s findings respectively. Interestingly, we found that the flexibility

of virtual classes can help solve some issues with internet connection or other technical issues. Particularly, the students can find out better places for learning to deal with some online-related issues. Additionally, they can have appointments online with their friends or lecturers at appropriate time to retake the knowledge from their missing lessons.

In terms of usefulness of virtual classes, our finding regarding improving student's skills in using an online learning platform corresponds to the previous finding by Aji et al. (2020). In terms of the learning outcomes, our students express their satisfaction toward their learning outcomes which contradicts the findings of Adnan and Anwar (2020) that rejected the role of online platform in facilitating desired learning outcomes. In addition, our result confirms Francescucci and Rohani (2019)'s finding that supports the equivalent learning outcomes between online students and face-to-face students, indicating that online learning can provide satisfactory learning outcomes. This positive result reflects the effectiveness of using Google Meet platform in the current context, supporting the previous hypothesis.

Online learning in the current context at this time is a quite new learning mode, which can cause some difficulties for both lecturers and students (Asian Development Bank, 2021). However, online platforms have been established to optimize such online teaching and learning activities (Palloff, 2013). Consequently, Google Meet features allow students in the context to actively participate in their online classroom. The more effectively these features are employed, the better experience students can have with their online classes (Alliance for Excellent Education (2016), as cited in Carrie et al., 2017). In fact, we found that the participants have positively experienced the Google Meet tool. Our findings support the Activity theory in the way that there is interplay between the tool we use and the experience we have. In other words, the online learning tool plays significant roles to optimize students' online learning.

From the findings, we have several implications for teachers and learners in online learning. For teachers, breakout rooms and other interactive features in virtual learning platforms such as video, audio, hand raising, jam board and chat box are beneficial to learners' interaction. Therefore, we suggest that the features should be applied in designing group work or pair work activities for cohesive groups to enhance students' interaction and sense of community. In addition to that, a positive learning environment should be made by having daily communications between teachers and students (McInnerney & Roberts, 2004) to enhance learners' relationships, which fosters their sense of community. For students, they can take advantage of the flexibility of virtual platforms to revise missing lessons by having online meetings with their classmates or watching recorded lessons.

The Prospect of Blended Learning Post COVID-19

63.8% of participants prefer blended learning as the future form of learning post COVID-19. They believe that this new form is better than any other forms, such as full online or face-to-face ones because it can provide the positive aspects of both face-to-face and synchronous online learning. The majority of learners who prefer this learning form indicate that learners can save time and cost of traveling. In addition, they prefer attending online sessions because they find it easier to engage with their lecturers while face-to-face sessions allow them to interact with their classmates and take advantage of school amenities. This result of this study is consistent with Dao and Ha (2021)'s finding that students perceive online learning as their favorable future learning. Additionally, it is in line with the Vietnamese Government's policy. Therefore, it is in the literature that supports the innovation of syllabus for blended learning in the future.

CONCLUSION

The COVID-19 pandemic has made a significant alternative in Vietnamese education where face-to-face classes are considered as dominant. The transition from physical to virtual classes is viewed as a positive experience. EFL Vietnamese students perceive that virtual classes enable them to easily interact with their lecturers and peers and promote their sense of community in virtual classrooms. Furthermore, there has been a light change in the student's perspective of learning mode that blended learning is perceived as the potential for Vietnamese higher education in the post COVID-19.

Limitation and Recommendation

There are two limitations of this study. Firstly, our findings are limited in self-reported data which is sometimes argued that the participants might be less truthful (Nanni & Pusey, 2021) due to social desirability bias (Dornye & Taguchi, 2010). However, our careful explanation of the purposes of the research and emphasis of their confidentiality would make them feel most comfortable and are willing to share their views (Dornye & Taguchi, 2010). Hence, we suggest that future studies can be conducted by using this method in combination with others such as observation, interviewing lecturers or analyzing content through video recordings, which allows researchers to generate findings from multiple data. Another limitation is related to the small sample size within an institution although triangulation of the mixed methods design can provide reliable results. This sample size could limit the potential to generalization. Therefore, future studies can be undertaken with larger sample sizes in varied contexts to generate a whole picture of virtual learning.

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TAKING THE PICTURE OF INFORMAL DIGITAL LEARNING OF ENGLISH (IDLE) IN A HIGHER EDUCATION TURKISH EFL CONTEXT

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ABSTRACT

Informal Digital Learning of English (IDLE) refers to individual's learning endeavor occurring in out-of-class environments in a naturalistic way independent from the requirements of a formal education program including assessment. Learners' IDLE experiences in English as a Foreign Language (EFL) contexts are quite important to understand their motives, and the potential ways to improve such practices for enhanced language practice. This study aims to present IDLE practices of higher education Turkish EFL learners in detail and investigate the motivations of EFL learners considering their actual endeavors with digital language learning sources. For this purpose, a total of 115 students from an English Preparatory Program at a university in Turkiye took part in the study. Within a quantitative research design, the data were collected through a questionnaire developed for the purposes of the study based on rigorous research on IDLE literature to identify EFL learners' IDLE practices, their motivations on using digital sources for language practice, potential difficulties regarding such practices, and the role of guidance. The results of descriptive statistics indicated that the majority of the participants spent their time on IDLE practices mostly for using social networking platforms, music and song platforms, translation sites, video sharing sites, and series and movies on specific network platforms. Findings also showed that teacher's guidance had great importance on the participants' IDLE practices and learners needed systematic guidance in the vast world of digital sources for effective language practice. What is more, some obstacles hindering EFL learners' IDLE practices were identified such as the expenses related to digital sources (e.g. membership fees, internet costs, etc.) which echoed the reality of the digital divide. The findings of the study are quite important in understanding the need to use digital sources for learners' informal learning practices. This study has certain implications and suggestions for language practitioners and teachers to foster IDLE practices.

Keywords: Informal digital learning of English, IDLE practices, IDLE for language enhancement, the role of informal digital sources in English as a Foreign Language.

INTRODUCTION

Educational advancements have an inevitable role in the development of society. The digital transformation of the 21st century has created an accessible learning environment which leads to a vast source of opportunities supporting education outside the traditional classrooms. This digital age has demolished the walls of formal education settings by giving more space to life-long learning which emphasizes learning regardless of time and space. The recent developments in digital technology and its ubiquitous nature have changed the frame of learning outside of the classroom as well. This constantly updated world has led to a new opportunity for

Language Learning Beyond the Classroom (LLBC) for learners (Reinders & Benson, 2017; Reinders, Lai, & Sundqvist, 2022). With the appearance of digital transformation and digital pedagogy, language learning experiences have started to be examined through online informal learning of English (OILE) (Sockett, 2014; Toffoli & Sockett, 2015) or informal digital learning of English (IDLE) (Lee & Dressman, 2018; Lee, 2019; Lee, 2022). The two views enable to realize the opportunity for language learning expanding beyond the classroom through digital devices and resources and they both value autonomous learning in their relatively unstructured contexts. IDLE in extramural contexts is naturalistic, digital learning of English comes about in unstructured, out-of-class environments and it must be independent from a formal education program. For example, students watch some live videos, make comments during the live stream, and interact with other English users from around the world. In this case, there is no external instruction and no assessment for students; instead, they select the digital source and the content to follow on their own. Besides, they concentrate on being the user of the language. As a term, IDLE covers both the 'informality' since language development occurs except formal educational settings, that is beyond the classroom (Benson, 2011), and 'digital learning' which emerges as an umbrella concept and as a brand-new approach for learning through technology use (Siemens, 2014).

The place of IDLE has become more apparent with the unexpected fact that most people had to switch to a digital world after the COVID-19 outbreak. This sudden change, as Chik and Benson (2020) noted, showed that the key point was digital adaptation. Digital practices of people have gained much more importance than ever. The pandemic accentuated the digital divide which refers to the inequalities in access to and use of Information and Communications Technology (ICT) and in digital skills (Hilbert, 2016; van Deursen & van Dijk, 2018). According to OECD (2021) report, in some countries like Malaysia, Mexico, Morocco, Peru, the Philippines, and Vietnam, four in five disadvantaged students did not have access to the Internet at home but only at school before the pandemic. It is most probable that the digital divide has broadened during the pandemic by making educational conditions worse for disadvantaged learners. This crisis has shown that digital transformation has to be accelerated by highlighting the significance of digital technologies infrastructure to narrow down the digital divide. In another worldwide education report, PISA 2018 ICT familiarity survey showed that learners' average duration of time per week using digital devices during classroom lessons and outside of classroom lessons for language lessons was 41 minutes across OECD countries. In Turkiye, learners reported about 39 minutes a week which was quite close to the average (OECD, 2021). This amount of time can be utilized to deal with learners' educational needs in digital learning environments. In this respect, identifying learners' IDLE practices would help to realize the changing educational needs and the services to be provided to enhance learning. Despite several research on IDLE in various English as a Foreign Language (EFL) contexts around the world, there has not been a previous study, to the authors' best knowledge, conducted specifically on IDLE practices in the Turkish EFL context. There is also a scarcity of research related to online English learning outside the classroom in Turkiye (e.g., Balbay & Kilis, 2017; Dincer, 2020; Gorgun, 2015). Thus, the purpose of this study is to find out the informal digital learning of English (IDLE) practices of Turkish EFL learners and to investigate motivating and challenging factors for learners' IDLE practices in their language learning process.

INFORMAL DIGITAL LEARNING OF ENGLISH

Lee (2017) defines the phenomenon of IDLE as "self-directed, informal English learning using a range of different digital devices (e.g., smartphones, desktop computers) and resources (e.g., web apps, social media) independent of formal contexts" (p. 2). Godwin-Jones (2018) has argued that the concept of complex systems theory (complexity theory) can be useful for searching informal language learning in digital environments. In Complexity Theory (CT), language is "a dynamic system that is constantly being transformed through use" (Larsen-Freeman, 2018, p. 58). Regarding CT paradigm, Godwin-Jones (2018, p. 14) states that "change and development occur within the nested subsystems of language, language development, and L2 online use." Thus, changes in one of the systems can influence other systems, and this results in various outcomes. In this respect, language is viewed as constructed through interactions and as patterns emerging from repeated encounters with language in various contexts. With the changing nature of learning in digital environments, the construction of digital language learning experiences, then, need to be identified to understand the underlying factors that shape out-of-class experiences.

Recently, there has been a growing interest in IDLE which helps learning out of the class in EFL contexts. Several studies have explored the frequency (quantity) and diversity (quality) of IDLE activities used by EFL students concerning English learning outcomes (e.g., Lee, 2018; Lee, 2019; Ohashi, 2019). In one study, Lee and Dressman (2018) investigated the relationship between the quality of IDLE activities used by 94 South Korean university EFL learners and their English outcomes. Findings indicated that engaging in diverse IDLE activities was found to significantly predict students' English-speaking proficiency. It was also seen that a diverse use of IDLE activities contributed to greater willingness to communicate (WTC) online and higher productive vocabulary scores. With respect to the influence of teacher-led support on English language learners' digital technology use out-of-class language learning, Ohashi (2019) carried out a mixed-method study in Japan with questionnaires and interviews. As part of the English writing course, the researcher designed some supportive elements to enhance out-of-class English language learning through digital technologies during a 10-month course. The findings showed the important role of teachers in guiding students in the use of digital technologies, and it was revealed that all students used more online tools during the course than before and the usage increased in six months period compared to pre-course and post-course results. In the Turkish context, Dincer (2020) conducted a study to understand EFL learners' out-of-class language learning experiences through digital practices. With a cross-sectional survey design, the study investigated autonomous language learning and out-of-class technology engagement of 512 university students. The findings indicated that more autonomously engaged students tend to have better language learning proficiency. Besides, the more autonomously engaged students spent more time daily and used varied digital tools. Online websites and social media were the most frequently used digital tools for participants. It was also revealed that students benefited from social media, online websites, dictionaries, and intelligent tutoring system applications (apps). Online games, YouTube, Instagram, and other smartphone apps that enable students to practice communication also had an impact on language development.

Numerous researchers have pointed out that IDLE can enrich the autonomous learning environment for language learners. Therefore, as the learners become more autonomous, they can be more engaged with IDLE. Recent digital sources allow learners to take more control over their own language learning outside class. For instance, research has shown that digital video materials promote incidental vocabulary acquisition (Lin, 2011) and learning autonomy (Watkins & Wilkins, 2011). It was added by Watkins and Wilkins (2011) that YouTube is pretty useful for educators who are interested in facilitating learner autonomy and student-centered learning.

As the digitalized world generates its pros and cons, some challenges in IDLE occur as well. Digital divide can be seen as one of the main challenges for IDLE. While it refers to inequalities in accessing digital facilities mainly, "second order digital divide" refers to not only online access but also unequal broadband speed and consistency of internet connection (Brotcorne, Damhuis, Laurent, Valenduc & Vendramin, 2010). When language learners do not have these fundamental facilities to engage in digital learning environments, they cannot be exposed to the target language except formal education settings. Hence, developments in the infrastructure of the countries can affect language learners' IDLE integration into their daily life directly. Another important challenge in IDLE is lack of digital literacy competencies. In order to find the right digital source to meet learning needs, learners are required to have digital literacy skills; otherwise, they can spend their time and effort in vain among great numbers of content. They are supposed to be a socially responsible user of the Internet and social media (Hobbs & Moore, 2013). Digital literacy helps learners to gain self-confidence in the digital space and reach the information safely.

The recent attention and popularity of IDLE have aroused more interest for future research. To this end, Soyoof et al. (2021) prepared a scoping review to examine what has been done in IDLE and what should be done as the next steps. It was found out that studies about IDLE were mostly published between 2017-2020 indicating a recent interest in IDLE practices of learners in various contexts. Most of the studies in this review followed a qualitative design and a mixed-method design while there were only two qualitative studies. Most studies were conducted in Europe followed by Asia and North America; therefore, the review suggested that other learning contexts should be considered for future studies. This study also highlighted the need for more rigorous research on language learners' informal digital practices to shed light on the motives and challenges regarding learners' IDLE practices.

Regarding the growing interest and need to identify EFL learners' IDLE practices to help them effectively deal with the digital world and the scarcity of research in this area, this study attempts to present IDLE practices of Turkish EFL learners in detail and investigate the motivations of EFL learners considering their actual endeavors with digital language learning sources. Hence, the following research question is addressed: What are the IDLE practices of Turkish EFL learners regarding their foreign language learning experiences?

METHOD

This study employed a quantitative research design to find out the IDLE practices of Turkish EFL learners along with their motivations. The rationale for designing a quantitative study was to reveal learners' current IDLE practices, the challenges, and the needs to navigate in the digital world for language learning endeavors that would enlighten to design further IDLE opportunities. For this purpose, a questionnaire was developed addressing demographic variables and various IDLE practices.

Participants and Setting

A total of 115 students from an English Preparatory Program at a private university in Turkiye took part in the study. The participants were selected following a convenient sampling strategy indicating that all of them were voluntary, accessible, and willing to take part in the study (Creswell, 2012). The participants were 64 males (55.7%) and 51 females (44.3%) whose ages ranged between 17 and 25 with the majority of them between 17-19 (n=66). When it comes to the participants' previous English learning experience, 53 of them declared that they have been learning English for 5-9 years. 34 of them have been learning it for 0-4 years and 22 of them have been learning the language for 10-14 years. Some participants (n=6) stated that they have been learning English for 15 years or more than this. The participants were studying at different proficiency levels of the English preparatory program as A1-Elementary (n=83), A2-Pre-intermediate (n=18), and B1-Intermediate (n=14). It was important to include learners from various proficiency levels to take a detailed picture of Turkish EFL learners' IDLE practices.

In the study context, English preparatory program aims B1+ (intermediate +) exit level based on CEFR offering 24-20 hours in a week according to students' levels. The program is comprised of three modules in total and education is carried out on the levels of A1 (beginner), A2 (pre-intermediate), B1 (intermediate), and B1+ (intermediate+). To reach the required exit level of the program, students attend English courses including integrated skills lessons (12 hours for reading, writing, grammar, vocabulary, and 12 hours for listening, speaking, grammar, vocabulary). As part of extracurricular activities, online asynchronous tasks are given. In terms of IDLE, there is no extramural leading for students formally to out-of-class digital sources, but some instructors can have spontaneous referrals based on their personal observations on students' needs or demands. A higher education ethical committee including experts approved the study and all participants signed consent forms regarding their voluntary participation prior to data collection.

Instrument

An IDLE questionnaire was developed for the purpose of the study based on several previous studies (Arndt, 2019; Ohashi, 2019) and the related literature on IDLE. The questionnaire was revised by four experts in language teaching and digital technologies for reliability and the final version was administered to the participants. The questionnaire included three parts addressing (1) learners' demographic information (i.e. age, English learning experience, level, etc.), (2) their IDLE practices in detail, the role of guidance in their out-of-the-class digital practices, (3) their motivations on using digital sources for language practice, and potential difficulties regarding such practices. The questions were closed responses and there was an "other answers" section for participants to add alternative responses. The second part of the questionnaire aimed specifically to find out the diversity and the frequency of digital tools used by the participants during their informal English learning (e.g. Which digital tools do you use to improve your English out of class? How often do you use these digital tools to improve your English out of class?). Besides, this part investigated how the participants decide on digital sources for IDLE (e.g. Do you follow some criteria while choosing a digital tool to improve your English out of class?). In addition to the list of digital tools presented in the literature, a small sample of EFL learners was asked about the digital tools they use for learning English. Their answers were collected, and appropriate options were added to the digital tool list in the questionnaire. The questionnaire was administered in Turkish, which is the mother tongue of the participants, to avoid incomprehensibility because of low English proficiency and to increase the validity.

Data Collection and Analysis

Data collection procedure lasted for two weeks. First, all the students in the preparatory program were invited to take part in the study. Voluntary participants were selected based on their consent. The IDLE questionnaire developed for the study was transformed into an online form to collect and store the data. Participants were asked to fill out the questionnaire by using Google Forms. In this way, the data were stored in an online cloud. After the gathering of the data via the IDLE questionnaire, the data were analyzed through descriptive statistics, getting the percentages and frequencies. The aim of conducting descriptive statistics was to identify the time the participants spent while studying English on the digital realm, the tools they used to access the digital sources, their most and least preferred platforms to study various language skills, how they decided on the IDLE sources, the motivating factors for IDLE practices, and the challenges they faced. Following this detailed analysis of higher education Turkish EFL learners' IDLE practices, a further study was designed based on the needs revealed in this preliminary study. Thus, the current study was quite important in revealing various features of IDLE at the Turkish higher education EFL context. While analyzing demographic information in the first part of the IDLE questionnaire, the frequency was calculated. For the second part, data were analyzed by getting the mean values of each digital tools/platforms so how often and how varied participants use IDLE sources was listed through mean values. Besides, frequency values were used to compare some specific digital sources and to present how participants decide on IDLE sources. An open-ended question was asked to find out how the participants decided on digital sources for IDLE and participants' short answers were analyzed through descriptive statistics. The frequency values of short answers were used for data analysis. In the analysis of the last part, percentages of participants' responses were calculated to find out the motivating and deterring factors for IDLE. The findings were interpreted based on the obtained data in the following section.

FINDINGS

In addressing the IDLE practices of Turkish EFL learners to improve their language learning process, descriptive data analysis was carried out and the results were demonstrated in Table 1. below.

Table 1. Results for Time Spent on IDLE and Participants' Access to Digital Devices

Time spent on IDLE	n	Participants' access	n
0-2 hours	76	Smartphone	115
2-4 hours	26	Internet	112
none	10	Sufficient Internet for IDLE	99
6+ hours	3	Computer	88
		Tablet	32
Total	115	Total	115

As given in Table 1., findings showed that the majority of the participants studied English using digital tools/platforms out of the class about 0-2 hours a day (n=76). This is followed by 2-4 hours (n=26), none (n=10), and 6 hours and more (n=3). The data indicated that all participants had smartphones (n=115) while 88 of them had their own computers. It was identified that most of them (n=112) had internet access out of class to study English, but some participants (n=16) stated that their internet access was not sufficient to practice English out of class. The majority of the participants (n=83) did not own a tablet while 32 of them had this device that they used to connect to the internet. This descriptive part showed that all participants had access to the internet even though it was not for the purpose of studying English all the time. The majority of them were familiar with language practice opportunities via digital tools/platforms; however, there were students who did not use digital sources for language improvement. The following parts give the IDLE practices of the participants in detail.

Preferred Digital Tools/Platforms for English Practice

Findings showed that some digital tools/platforms were widely used with the aim of out-of-the-class language practices while some of them were not preferred. Table 2. below summarizes the participants' digital tools/platforms uses. The value for each frequency was determined as follows; 5 (*Daily / Almost daily*), 4 (*At least once a week*), 3 (*At least once a month*), 2 (*Rarely*), and 1 (*Never*). When asked for their preferences regarding digital tools/platforms to study English out of class, the majority of the participants stated that they used social networking platforms (e.g. *Twitter, Instagram, Facebook, TikTok*) (M=4.73). The second most preferred choice was music and song platforms (e.g. *Spotify*) (M=4.58). Translation sites (e.g. *Google Translate*) (M=4.54), video sharing sites (e.g. *YouTube, Vimeo*) (M=4.34), and series and movies in the platforms (e.g. *Netflix*) (M=4.33) were other popular platforms used by the participants for their informal digital language practices. Participants stated that they also referred to web-based dictionaries (e.g. *Tureng, Cambridge Dictionary*) (M=4.01), song lyrics (e.g. *Lyricstraining*) (M=3.94), vocabulary apps (e.g. *Memrise, Duolingo, VoScreen*) (M=3.33), online games (M=3.31), and online news sites (e.g. *BBC News, Reuters*) (M=3.26).

As can be seen from Table 2., the most preferred platforms were social networking sites which were not originally designed for English language practice for learners. The participants spent time on these sites to follow the English content (i.e. videos, posts, messages) popular/trendy topics or people's social media posts or accounts, and to communicate with other people in English. Fewer participants stated that they followed contents specifically designed for language learners like English self-study sites (e.g. *British Council Learn English*) (M=3.30) and writing Apps/assistant (e.g. *Grammarly*) (M=2.75). Similarly, podcasts (e.g. *BBC, Nationalgeographic*) (M=2.88) and blogs (e.g. *Espresso English Blog*) (M=2.58) were preferred by fewer participants. Another finding indicated the number of participants who used educational vlogs for language learning (e.g. *ETJ English*) (M=2.75) and attended live EduTuber classes on language learning (M=2.63). It was seen that while video sharing sites were used by most of the participants (M=4.34), they did not spend their time on educational content designed specifically for language practice. The least preferred digital tools/platforms were identified as comics and cartoons (e.g. *Webtoon*) (M=2.60), presentation platforms (e.g. *TED Talks*) (M=2.48), corpora (e.g. *COCA, BNC*) (M=2.13) and audiobooks (e.g. *Audible, Scribd*) (M=2.11).

Table 2. Summary of Results for Digital Tools/Platforms Used by the Participants

Digital tools / platforms	$\bar{X}$
Social networking sites (e.g. *Twitter, Instagram, Facebook, TikTok*)	4.73
Platforms for music, songs (e.g. *Spotify*)	4.58
Translation sites (e.g. *Google translate*)	4.54
Video sharing sites (e.g. *YouTube, Vimeo*)	4.34
Series and films on video streaming platforms (e.g. *Netflix*)	4.33
Web-based dictionaries (e.g. *Tureng, Cambridge Dictionary*)	4.01
Song lyrics (e.g. *Lyricstraining*)	3.94
Vocabulary Apps (e.g. *Memrise, Duolingo, VoScreen*)	3.33
Online games (on computer/smartphone/social networks)	3.31
English self-study sites (e.g. *British Council Learn English*)	3.30
Online news sites (e.g. *BBC News, Reuters*)	3.26
Podcasts (e.g. *BBC, Nationalgeographic*)	2.88
Educational Vlogs for Language Learning (e.g. *ETJ English*)	2.75
Writing Apps or assistant (e.g. *Grammarly*)	2.75
Live classes of Edutubers (e.g. *YouTube-English Speaking Success*)	2.63
Comics or Cartoon platforms (e.g. *Webtoon*)	2.60
Blogs (e.g. *Espresso English Blog*)	2.58
Presentation platforms (e.g. *TED Talks*)	2.48
Corpus (e.g. *COCA, BNC*)	2.13
Audiobooks (e.g. *Audible, Scribd*)	2.11

Especially for corpora and audiobooks, many participants (n= 52) stated that they were not familiar with these platforms and never used them. Indeed, these digital platforms offer diverse opportunities for language practice. Corpora enable to use concordance lines and help to see authentic language use in the context. The content in the corpora can be used for various language skills. Likewise, audiobooks provide rigorous listening practice for language learners. Some of them include online dictionaries for vocabulary or reflection parts for writing activities. It was clear that the participants in general did not take advantage of such tools as part of IDLE practices.

Similarly, some participants stated that they never used presentation platforms (n=39), comics and cartoons (n=39), live classes of EduTubers (n=38), and writing Apps/assistant (n=35). Other online tools/platforms which were not given in the list but used by the participants to study English out of the classroom were *Discord* (n=1), *Cake* (2-3 days a week) (n=1), *Free4talk* (for speaking practice) (n=1) and *Steam* (English groups/communities in the platform) (n=1). The common feature among these apps is that they offer communication opportunities in English. They provide instant messaging or speaking practice for users. Users can be exposed to real-life English by using these apps; thus, the young generation prefers using these apps while playing games or improving their communication skills.

Criteria for Selecting Digital Tools/Platforms for English Practice

The participants were also asked about the criteria they followed while choosing a digital tool/platform to improve their English outside the class. This part was added to the questionnaire to find out the factors that affect higher education students in their selection of IDLE practices and to be able to foster motivation in the future based on the criteria they follow while choosing IDLE tools/platforms. Figure 1. below displays the criteria used by the participants in their informal digital practices.
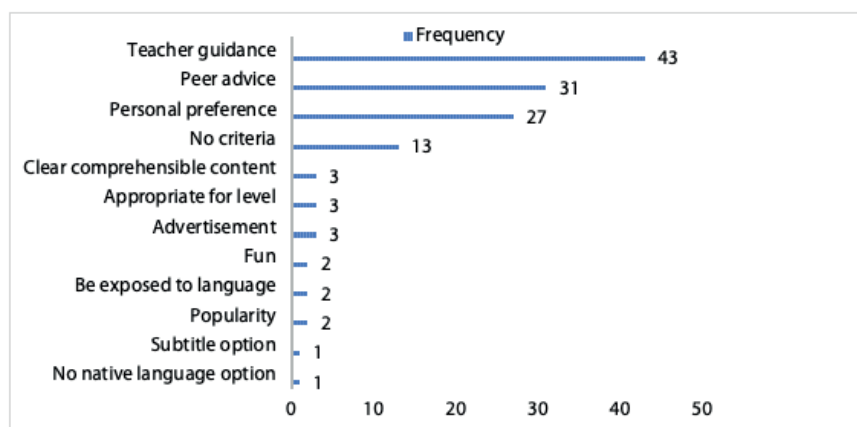
Figure 1. Deciding on IDLE Source

As can be viewed in Figure 1., the results revealed that most of the participants decided on IDLE sources following their teacher's guidance (n=43). Secondly, the participants listened to their friends' advice (n=31), or they decided on the source which appealed to their interest (n=27). It was clear that the majority of the participants followed others' advice (i.e. teacher, peers) when they wanted to practice English out of the classroom. It was seen that some participants did not have any criteria while choosing a digital tool/platform for informal practice (n=13). This showed that for some participants, IDLE practices were at random without any conscious choice to practice language skills or areas. For other participants, there were some other criteria items expressed by the participants in selecting the IDLE source such as its having clear and comprehensible content (n=3), its appropriateness for learner's language proficiency level (n=3), seeing advertisements about it (n=3), its being fun (n=2), its provision of opportunity to be exposed to the target language (n=2), its popularity (n=2), its not having a counterpart in their native language (n=1), and its having a caption/subtitle option (n=1). That is, clearly identified conscious purposes in the selection of IDLE sources were only preferred by a few participants.

Motivating Factors for IDLE Practices

For the purposes of the study, the participants were asked to state their motivations to use digital tools/platforms in English. Identifying the motivations to resort to IDLE practices as an extramural activity was crucial to find out the needs of the learners in the digital English language environments. The results regarding this part of the questionnaire can be seen in Figure 2. below. According to the results of the analysis shown in Figure 2., 96% of the participants wanted to improve their speaking skills most. This was followed by goals in other main language skills and use such as learning vocabulary (92%), improving pronunciation (88%), improving listening (86%), and improving grammar (84%). This finding was in parallel with the preferred IDLE tools/platforms as the students spent time online communicating with people via social media platforms, playing interactive online games that require communication skills, and watching/listening/reading various English content on different platforms. It was clear that learners reported a need to improve language skills and areas to keep up with the digital world. Getting better grades in English classes (83%) was regarded as more important than improving reading skills (79%) by the participants. Since the students were at a higher education institution, getting good grades was considered as a motivating factor to look for IDLE practices outside the regular classrooms.
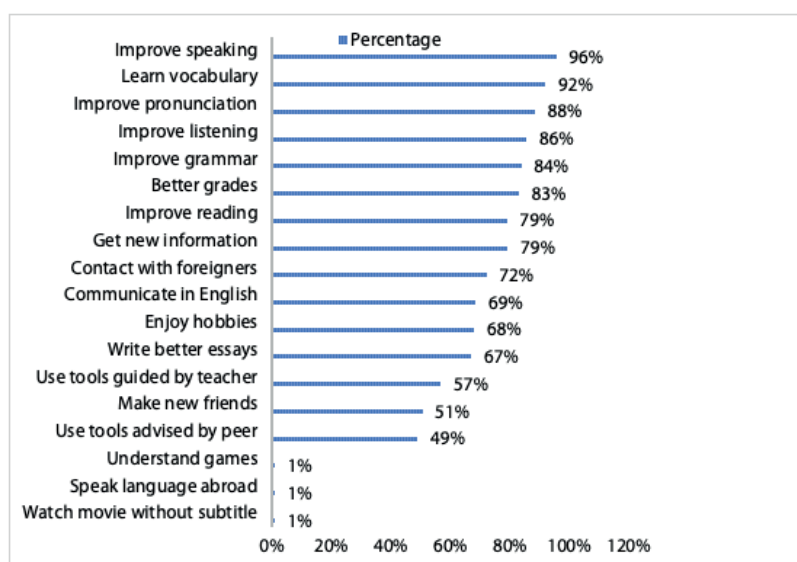
Figure 2. Motivating Factors for IDLE

Getting new information (79%), having contact with foreigners (72%), communicating in English (69%), enjoying hobbies (68%), and writing better essays (67%) were other motivational reasons stated by the participants. They also asserted using digital tools/platforms guided by the teacher (57%), making new friends (51%), and using digital tools/platforms advised by a friend (49%) as motivating factors for IDLE. Some participants noted other reasons that motivated them to use digital tools/platforms to study English out of the classroom as to understand online games with English stories (n=1), speak the target language abroad (n=1), and watch movies without subtitles (n=1).

Deterring Factors for IDLE Practices

The participants were also asked to state deterring factors to use digital tools/platforms in English. Along with the motivational factors, identifying the challenges and problems of IDLE practices was quite important to help learners deal with the drawbacks they are experiencing. Figure 3 displays the deterring factors that deprive learners of effective IDLE practices. As Figure 3 below displays, the most discouraging issue for the participants was the expenses required for the use of digital tools/platforms (e.g. membership fee, internet bill, etc.) expanding their budget (36%). Considering the financial difficulties of a higher education student,

the cost of digital tools/platforms is revealed as a compelling factor. Some participants also had concerns about the protection of personal data security, and they did not want to share their personal information online (e.g. real name or profile photo) (19%). A considerable number of participants declared that they did not know how to use digital tools/platforms for their out-of-the-class language learning (17%) practices.
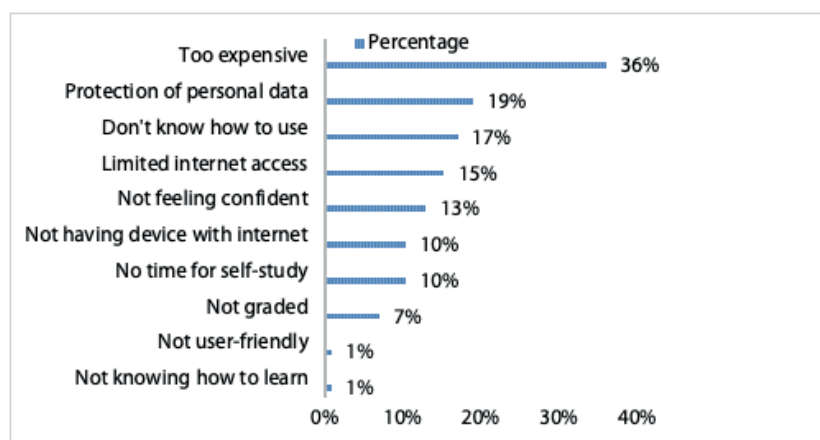
Figure 3. Deterring Factors for IDLE Practices

Other deterring factors were listed as limited internet access (15%), not feeling confident using digital tools/platforms (13%), not having a device with internet for out of class study (10%) and having no time for self-study out of the class (10%). 7% of the participants did not think out-of-the-class study using digital tools was necessary since their efforts were not graded in formal educational contexts. Some participants noted other reasons that discouraged them to use digital tools/platforms to study English out of the classroom as some platforms' not being user-friendly (n=1) and not knowing how to learn through IDLE experience (n=1).

All in all, the findings of the study indicated that higher education students in a Turkish EFL context had varying needs and motivations to navigate in the digital realm for English language learning purposes. This study presented in detail the IDLE sources learners preferred, learners' criteria for consulting IDLE sources, their motivations in using digital tools/platforms, and the challenges they faced in their attempt to get involved in digital English language practices. In this regard, in the following section, this study has certain implications for language practitioners and teachers to use digital sources more effectively for language learning/teaching purposes, and it also offers certain suggestions for further studies remarking on the future of IDLE.

DISCUSSIONS AND CONCLUSION

The study has shown that most participants spent approximately 0-2 hours a day on IDLE practices. Among these practices, music and song platforms, translation sites, video sharing sites, and series and movies on the platforms were quite common. Social networking platforms were the most preferred digital tool, a finding consistent with the previous research (Dincer, 2020) in the Turkish EFL context. On the other hand, it was found out that educational content which was designed for language practice like live language classes on YouTube was preferred by fewer participants. It might be concluded that using technology frequently and accessing digital tools easily do not guarantee a conscious use of technology for educational purposes (Wang & Chen, 2020). Live language classes prepared by professional tutors on digital platforms offer lots of opportunities including grammar explanations, related examples, live interaction with participants through question-and-answer sessions, and mainly exposure for the target language. However, it is apparent from this result that the participants cannot take the opportunity to use some of the most useful digital content which can meet their language needs. In this respect, instead of using technology for technology's sake, using technology in a purposeful and an effective manner in language teaching and providing guidance for this perspective is highly crucial. In the vast realm of digital resources, it is clear that the students need the guidance of more knowledgeable tech-savvy teachers. In this respect, there is also a need to inform teachers and provide them training in IDLE as well.

The findings revealed that there were several platforms that were rarely used by the participants such as audiobooks, corpora, presentation platforms, comics and cartoons, and writing applications. The reasons might stem from the level of students or inadequate information on these platforms. In other words, if the participant was an elementary-level student, many books on the audiobook platforms might be difficult for that student due to low level of proficiency. At this point, leading students to free platforms that include different levels of reader content can be beneficial. In addition, students may not know about particular resources such as corpus-induced content since such tools are not presented within the formal curriculum content. Hence, guiding students to this kind of supportive platforms which presents spoken or written productions of language from real life will be helpful. The concordances which involve authentic pieces of language in real-life contexts can be presented in the language classrooms with samples and students can be motivated to use them outside the class. There are several professional, beneficial, and free digital writing assistant platforms as well. These sources help writers to find their own mistakes by presenting feedback and offer some suggestions through paraphrasing the content written by the informal learner. There are free automated writing evaluation tools that give online feedback and instant correction. As it is found out, unfortunately, the participants use digital sources for writing less frequently than other tools. Therefore, integrating these digital sources into the classroom environment and modelling the use of them can give some ideas to learners for their language production using informal learning outside the classroom. As a result, it was revealed that students were not familiar with specific tools/platforms catered for language learning purposes and the teachers' integration of such tools within the classroom environment would help the students use them as part of IDLE practices.

Findings also show that teacher's guidance has great importance on the participants' IDLE practices. This finding justifies previous studies which support the role of teacher's guidance in constructing effective IDLE experiences (Lai, Zhu & Gong, 2015; Lee, 2019; Lee, 2020). Nevertheless, the opposite side of the coin indicates the necessity of learner autonomy and digital literacy through which learners can decide on the right source of IDLE on their own; in other words, without the teacher's assistance. In this regard, the development and introduction of certain checklists to guide students' selection of effective digital language sources would assist them to make appropriate choices while navigating in the digital world. After the teacher's guidance, participants mostly follow their friends' advice while choosing IDLE tools, or they decide on the digital sources based on their personal interests. Some participants stated that they had no criteria for deciding on the right IDLE sources. Besides, some participants added that they were influenced by the advertisements and popularity of the digital tool while deciding on IDLE sources. As Sockett and Toffoli (2012) suggest, training learners for the development of communication and media skills would be more valuable than the demonstration of specific tools or platforms. Constantly evolving technology necessitates various digital learning tools in the course of time and up-to-dateness changes rapidly. Critical evaluation of digital sources as part of digital literacy skills is highly important for learners to navigate in the world of IDLE. Making conscious choices in this digitalized world can yield the best benefit for informal learning. One implication here is to offer digital literacy courses to the students as part of formal education to help them critically evaluate the effectiveness and reliability of any digital resource they are using.

Additionally, most of the participants indicated that they wanted to improve their speaking skills in the target language first. Learning vocabulary, improving pronunciation and listening are the following motivating reason for IDLE according to the participants. To cope with the digital content, language learners feel the need to improve speaking skills and related language areas such as vocabulary and pronunciation. Hence, guiding learners to use effective digital tools/platforms for interaction purposes is also gaining importance. Language learners in EFL contexts, like Turkiye, are disadvantageous of not being exposed to English much as part of daily endeavors and tasks. That is, in their daily life, EFL learners do not have opportunities to produce the target language; therefore, they feel the need to be exposed to spoken input. One way of providing such exposure is the integration of digital sources and informal learning that takes place out-of-the-class contexts ubiquitously. This need has been echoed in many EFL contexts in which EFL learners tend to use informal sources to be communicative, speak with fluency and use vocabulary and idioms they have gleaned from digital sources (Dressman, 2020).

Albeit several advantages IDLE promises, the participants had to consider some obstacles to make IDLE a part of their life since the expenses for IDLE (e.g. membership fee, internet cost, etc.) were expanding their student budget. This finding once again echoes the reality of the digital divide regarding the financial availability of the digital world for some learners (van Dijk, 2019). One implication here is to support language learners at an institutional base and make at least digital tools tailored for language learning purposes available to students. Ministries of education, universities and private business endeavors can fund students to have free access to language learning resources. What is more, one of the main deterring factors for IDLE was identified as not knowing how to use digital tools/platforms for out-of-the-class language learning purposes. This finding is in accordance with findings from previous research (Ohashi, 2019) indicating the importance of awareness in using technology for educational purposes. The young generation may well be familiar with social media use, as indicated by the results of this study as well, however, they may not know which sources are effective and reliable for language learning purposes. Besides, they may not know how to use them in a sustainable manner to enhance language learning. As mentioned by the latest OECD (2022) brochure entitled "Building the Future of Education", education has been on the verge of the combination of formal and informal learning. Hence, in the same document, one of the propositions is that improving the understanding of educational institutions as sites offering both formal and informal opportunities to learn and develop policies to empower schools as positive learning environments (OECD, 2022). As a result, in spite of leaving students on their own in the digital world, there is a need to bridge the gap between formal and informal foreign language education. In this respect, making students familiar with available and accessible tools/platforms and how to use them through modelling and guidance to select and use the most appropriate ones outside the classroom would likely to shape the future of IDLE.

This study presented here had some limitations as well. As Ardnt (2019) pointed out in her study, the findings obtained from the surveys are relatively broad and may not provide an accurate idea to realize how the participants used these tools/platforms for their English learning practices. For instance, using social media websites can cover various behaviors including watching videos, taking a glance at a post or a photo, reading the content of different lengths, or producing their own content through spoken or written language production. Hence, there is a need to investigate IDLE practices in more detail. The results of the current study might shed light on designing an IDLE model to guide learners and teachers to enhance personalized language learning. As Reinders and Benson (2017) suggested, reflective journals might contribute to comprehend learners' engagement in digital environments. Thus, more detailed studies which involve both quantitative and qualitative data collection tools are believed to offer a better understanding for the nature of IDLE in EFL contexts. Besides, digitalization produces new tools and artificial intelligence technologies each day like the recent digital chatbot tool ChatGPT. Recent digital sources like these and the platforms stated by the participants in the current study might be involved in further studies to investigate their role in IDLE. Thus, this study might well be considered as the first step in exploring the IDLE practices of EFL learners. Future studies may consider providing systematic and comprehensive guidance on IDLE, developing tools such as checklists and digital handbooks to help students navigate more effectively in the vast world of digital advancements.

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PERCEIVED SUPPORT FROM INSTRUCTOR & PEERS AND STUDENTS' SELF-REGULATED LEARNING DURING TEMPORARY ONLINE PIVOTED LEARNING

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ABSTRACT

The third wave of the Covid-19 pandemic has made every higher education institution in Taiwan implement online learning. Given the circumstance, supporting students in their online self-regulated learning (SRL) became more critical to enabling students' learning maintenance and learning success. The present study explores the impact of instructor support and peers support on students' SRL during temporary online pivoted learning. 123 undergraduate and graduate students in Taiwan were surveyed on two scales The Instructor Support and Peers Support Questionnaire and The Self-Regulated Online Learning Questionnaire (SOL-Q). The descriptive results indicated that students had relatively good perceptions of instructor support, peers support and the online SRL. Additionally, the correlation analysis revealed that both instructor support and peers support had positive and moderate relationships with dimensions of the online SRL. Furthermore, the regression analysis substantiated the importance of instructor support to dimensions of metacognitive skills, persistence, and environmental structuring. In contrast, peer support was essential to metacognitive skills, persistence, and help-seeking. Lastly, there was a negligible impact of provided support on time management behaviors. The research suggested that educators and institutions should provide adequate support for students and facilitate interactive online learning environments for peer-to-peer support.

INTRODUCTION

Lifelong learning is considered the ultimate purpose of education, and self-regulated learning (SRL) is a means to that end (Hoyle & Dent, 2018). Schunk and Greene (2018) view SRL as a process through which students activate and sustain cognitions, behaviors, and effects to attain their goals. In online learning, the SRL become an even more critical factor in explaining the successful online learning experience (Broadbent & Poon, 2015; Wong et al., 2019) due to the lack of the instructor's supervision and social interactions for motivational and emotional factors.

The temporary pivot to online learning as the immediate response to the Covid–19 pandemic has once again postulated the importance of SRL in higher education (Atmojo, Muhtarom, & Lukitoaji, 2020). The term temporary online pivoted learning is used by Nordmann et al. (2020) and other researchers as a reference to the situation of school campus closure and the traditional offline courses being pivoted to online. In such emergent remote teaching, many students and course educators might not have voluntarily chosen the online method. This differs from the fully online distance course with their ordinary choice and motivation (Nordmann et al., 2020). As a result, exclusively online learning may not be well-suited for all students (Sason & Kellerman, 2021). Moreover, the core pedagogies utilized in most in-person courses are based on the interactions of educator-students and student-student (Nordmann et al., 2020). During the

emergent online teaching method, these interactions may be changed in nature and even not deficit for students to construct their knowledge. Given instructors' and students' lack of readiness and interaction limitations, temporary online pivoted learning requires more self-regulatory skills from students to maintain their learning and achieve academic success.

Further, a question is raised about how individuals (instructors, peers and so forth) who have close interactions with students in the course context can support the online SRL process. Recently, Edisherashvili (2022) conducted a systematic review of 38 studies in the areas of SRL in the period of 2010-2020 for an overview of the identified interventions on dimensions of the online SRL as well as the phases in the process in the context of higher education. The review indicated that the "support interventions" (Edisherashvili, 2022, p.1) had proven to have a positive effect on the online SRL. However, the investigations into the impact of support factors on SRL were distributed inadequately among the online SRL dimensions and phases, focusing more on the metacognition skills and performance phase. Furthermore, the research team also found out that the supportive factors affording personalization and flexibility should be further developed in the service of the online SRL. In an attempt to contribute to the existing gap in the study of supporting the online SRL, the present paper sets out to investigate the impact of student support on the whole online SRL process comprehensively. In more specific terms, of three main interactions in the online learning context including student-student, student-instructor, and student-content (Moore, 1989), the present research focuses on the support derived from the interactions between instructor and student and among students given its personalized and flexible features in the context of temporary online pivoted learning. To be more detailed, the present study aims (1) to clarify potential support that instructors and peers might offer to online learners; (2) to clarify the dimensions of the online SRL; (3) to examine the influence of the perceived support from instructors and peers on the online SRL during the temporary online pivoted learning. A good awareness of the online SRL and how instructors and peers could assist the online SRL process is necessary for educators and programs to support students' academic success in an uncertain era.

LITERATURE REVIEW

Self-Regulated Learning (SRL)

There have been many conceptions of SRL, however, the most used is from the social cognitive theory. The social cognitive arena views the human agency as the heart of self-regulation (Usher, 2012). Social cognitive researchers also highlight the self-regulation process's personal, behavioral, and environmental interactions. These factors are subjected to changes and monitored by learners to improve strategies, cognitions, affects, and behaviors accordingly (Schunk et al., 2014).

So far, plenty of SRL models have been proposed (Carneiro, Lefrere, Steffens, & Underwood, 2011). (Zimmerman, 2000) developed a social cognitive model of self-regulated learning titled the Zimmerman 3-phase Self-regulation model (2009). The model consists of 3 phases (forethought phase, performance phase, and self-reflection phase).

The first phase of *forethought* comprises task analysis and self-motivational beliefs. In the form of task analysis, students analyze the tasks, set goals, and select appropriate learning approaches. As for self-motivational beliefs, student generates their perceptions about self-efficacy, outcome expectations, task values, and goal orientation which influences the latter consequences of learning.

The *performance* phase is executed with subtasks of self-control and self-observation. Self-control deploys specific methods selected before in the forethought phase together with other skills to keep themselves engaged and finish the tasks. Self-control contains task strategies, self-instruction, imagery, time management, environmental structuring, help-seeking, interest incentives, and self-consequences. In the self-observation process, the student performs metacognitive monitoring and self-recording.

During the *self-reflection* phase, student assesses how they performed the tasks through self-judgment and self-reaction. A form of self-judgment, self-evaluation occurs when a student observes their progress in skill acquisition and compares it against some standards (Zimmerman, 2002). The state of self-reactions impacts students' self-efficacy, the satisfaction of accomplishing the goal, and belief about the acceptability of the learning process they made (Schunk et al., 2014). At this phase, how students react to their prior efforts affects subsequent forethought processes (Zimmerman & Bandura, 1994).

Dimensions of the Online SRL

Popular questionnaires have been used to measure online SRL, including the Motivated Strategies for Learning Questionnaire - MSLQ (Pintrich et al., 1991), the Online Self-regulated Learning Questionnaire – OSLQ (Barnard et al., 2009), the Metacognitive Awareness Inventory-MAI (Schraw & Dennison, 1994), the Learning Strategies Questionnaire-LS (Warr & Downing, 2000). In general, these models collectively cover key dimensions of online SRL, including Task definition, Goal setting, Strategic Planning, Environmental structuring, Time management, Task strategies, Help-seeking, Comprehension monitoring, Motivation control, Effort regulation, and Strategy regulation.

However, the Self-Regulated Online Learning Questionnaire (SOL-Q) was developed by Jansen, Van Leeuwen, Janssen, Kester, and Kalz (2016) as a combination of the above questionnaires. The SOL-Q model covers five dimensions: metacognitive skills, time management, environmental structuring, persistence, and help-seeking.

Metacognitive Skills: This large scale is the cooperation of five scales from theoretical models, including task definition, goal setting, strategic planning, comprehensive monitoring, and strategy regulation. From the theoretical point of view, these five dimensions are scattered over 3 phases of SRL. However, the research conducted by Jansen et al. (2016) show that students performed consistently in metacognitive activities. For example, if students work on task definition in the forethought phase, they will also engage in comprehension monitoring in the performance phase.

Environmental Structuring: Unlike learning in a traditional classroom with a controlled and structured environment, online learners "must be able to structure their physical learning environment, whether at home or elsewhere" (Lynch & Dembo, 2004, p. 5). Kocdar, Karadeniz, Bozkurt, and Buyuk (2018) also postulate that controlling the physical environment is a distinctive and vital SRL strategy for online distance learners. In recent research, Ng (2021) lists aspects of the physical environment and its impact on online distance learners in higher education. Ng (2021) states that online learners need a functional and comfortable space (with control of temperature, noise, lighting, air quality, and ergonomic furniture). The learning space should also have high-speed Internet and a comfortable learning station.

Persistence: Jansen et al. (2016) propose the persistence scale as the merge of motivation control and effort regulation.

Help-seeking: Newman (2008) contends that help-seeking is a vital strategy in self-regulated learning. In the traditional classroom, help-seeking can be performed through face-to-face interactions that allow students to ask for help. By contrast, in online learning (both synchronous and asynchronous formats), there is a reduced opportunity for immediate interactions for help-seeking. The popular means of seeking help are through online communication applications. As a result, help-seeking in online learning becomes more challenging and requires more effort and motivation from students to operate seeking help.

Time Management: According to Trentepohl and Leutner (2022), the time-management strategy can be seen in three phases forethought, performance, and self-reflection of the SRL process. Before the task, a student sets up an estimated duration and time frame for the task according to relevant deadlines and learning goals. While performing the task, the student follows the planned time and duration and monitors compliance. In the self-reflection phase, the student would review the actual time invested into the task in comparison to the outcomes. In asynchronous online learning, students are more active and autonomous in scheduling and managing learning time. However, given the reduced or no class control and instructor control, students need more effort and accountability to keep to the learning plan and maintain the learning process.

Perceived Supports Students Get from Instructors and Peers in Online Learning

In a broad sense, student support is any additional support offered to assist students in achieving academic aspirations and personal development. In discussing the purpose of the support for student learning, Earwaker (1992) states, "to ensure that they derive maximum benefit from their course" (p. 11). Given its importance to the student learning experience, coming to the online learning environment, student support becomes one of the vital elements affecting student achievement in the course (Rovai & Downey, 2010).

According to Thorpe (2002), there are two contexts of learner support: institutional and course contexts. Institutional context includes admission, registration, scholarship, research, student life issues (Thorpe, 2002), library services, help desk, and digital and technological facilities (Selim, 2007). The course context support encompasses course materials, learning activities, and assignments. In the present paper, student support is narrowed down to the course context, focusing on educators' and peers' support during online learning.

Instructor Support

According to Sang et al. (2011), instructional support refers to instructional guidance to learning (academic support); and "dialogues and course structures to motivate and encourage students to learn and master course materials and achieve learning objectives." (p. 159). Curley and Strage (1996) state that high instructional support in combination with high instructional demands promotes more sophisticated study strategies toward a higher level of performance.

Peers Support

In all learning contexts, students can get support from peers for both academic and non-academic issues through group work, peer tutoring, and peer facilitation, answering questions, encouraging each other, and forming a study group (Sang, Srinivasan, Trail-Constant, Lewis, & Lopez, 2011). Omar, Abdalrahim, Drewish, Saeed and Abdalbagi (2015) contend that effective peer interaction could contribute to a higher motivation to achieve learning outcomes. Therefore, creating a learning environment that is friendly and supportive of interactions is encouraged. However, due to a lack of social engagement in the online environment, students may need more support from instructors and other students (Muilenburg & Berge, 2005). As a result, students would find it more challenging to get peers support in online learning than in traditional offline classes. Therefore, if the online class can improve student interactions, the course will be more effective and enjoyable (Muilenburg & Berge, 2005). In that matter, Mălureanu and Enachi-Vasluianu (2021) emphasize the code of conduct in the online environment that must be based on "the principle of non-aggression, of cooperation for the common good" (p. 206).

With regard to the learning context, it is necessary to mention social comparison - the process of comparing learners themselves with others. Commonly, social comparison is often understood as competitiveness negatively. However, from the developmental perspective in social cognitive theory, adults often consider social comparative information during their self-evaluation in their SRL process (Schunk, Meece, & Pintrich, 2014). To some extent, social comparative information is the input in the SRL process and especially positively correlates to students' motivation to achieve in their learning (Schunk, Meece, & Pintrich, 2014).

The Influence of Instructor's and Peers' Support on Dimensions of Student's Self-Regulated Learning in Online Learning

Metacognitive Skills

Clear Expectations & Objectives and Syllabus Update: Instructors should clearly and concisely communicate course objectives and expectations so students can plan their learning appropriately (Zimmerman, 2008). Moreover, instructors must update students on any minor changes or adjustments to the course syllabus in response to emergency online learning. According to Carneiro et al. (2011), the criteria we apply to the course need means of communication. The instructor and peers are essential in informing students of relevant and key measures.

Goal Orientations: With the definition of goal orientation, which focuses on the situated purposes for action (Carter et al., 2020), instructors can foster the goal orientation process in students. When the learning environment is changed, in the case of pivoted online learning, the students may need to review their goals and adjust their learning approach for subsequent achievement. However, Duffy and Azevedo (2015) contend that goal orientation benefits the performance-oriented student group more than the mastery-oriented group.

Structured Materials: Different learning materials and resources should be uploaded onto one digital space for the student to access. Barth (2020) considers this practice vital to student success because they would better manage learning resources and spend more time reading materials (Edisherashvili, 2022).

Responses To Students' Questions and Clear Assessment Instructions: Sang et al. (2011) propose that instructors provided support, including answering students' questions, correcting their misunderstandings, and providing clear instructions for assignments. The participation of experienced supporters is essential to monitoring the accuracy and relevance of the learning practices. In other words, instructors could support students' comprehension monitoring in the SRL process.

Appropriate Feedback on Students' Assignments and Performance: Instructors can provide feedback on students' work in diverse formats such as written, audio, videos, or discussion posts to stay connected with students (Barth, 2020). Although task accomplishment is not always completed correctly, the teacher needs to ensure constructive feedback from which students are encouraged and motivated to learn (Mălureanu & Enachi-Vasluianu, 2021).

Receiving and providing peer feedback: Realising the importance of feedback, however, the educator cannot provide frequent and thorough feedback to every student (Liu & Carless, 2006). Feedback provided by peers can work as an alternative to help students improve their learning process (Gielen, Tops, Dochy, Onghena, & Smeets, 2010). Peer feedback involves comments on the peer's work, SWOT, and/or improvement tips (Falchikov, 1996). Through peer interactions, feedback receivers gain benefits, and the students who often provide feedback can improve their self-regulation skills (Boekaerts & Cascallar, 2006) and hone their understanding of the specific knowledge (Yu-Hui & Yu-Chang, 2013). Moreover, the recent research conducted by Gikandia and Morrowa (2016) shows that detailed assessment instructions are conducive to peer-to-peer feedback because they could support students in monitoring their peers' progress and provide more appropriate feedback. However, the peer-to-peer feedback would be bettered with tutor supervision.

Reflective Student Survey: Besides the official mid-term survey announced to students by school administrators, instructors can facilitate their reflective student survey to get the necessary information for course improvement. Under the circumstances that teachers must switch to emergent remote teaching, this information becomes more critical to make timely course corrections. This not only supports student success in the course but also creates an excellent chance for students to do reflections on their learning experience (Barth, 2020).

Group Discussion: Group discussion is considered one of the best ways to maintain interaction in the online environment. Within the group scale, students are expected to have debates, seminars, problem-solving sessions, research work, etc. These activities are conducive to mutual learning, cognition exchange, and fostering students' self-evaluation. However, to ensure the group discussion efficiency, it should be organised in alignment with students' levels and needs and principles of creating different experiences and competencies, roles, and models of relationships (Mălureanu & Enachi-Vasluianu, 2021).

Environmental Structuring

Despite the importance of the physical environment to the online SRL process (Kocdar et al., 2018), there needs to be more focus on this dimension; instead, online learning research studies have paid more attention to the virtual social environment. Each student may set up their learning environment during online learning in diverse physical conditions, living arrangements, and accessibility to digital devices and internet connectivity (Ng, 2021). Considering these factors is necessary for instructors to design appropriate learning activities. For example, since students already need to allocate their attention to both the physical and virtual environments, the instructor should consider **reducing the multiple tasks**. Otherwise, students may get more distracted and hence achieve worse task performance.

In addition, the instructor and online students can build **the code of conduct in the online course** by mentioning appropriate manners, for example, camera opening. From the student's side, they set up and control their own learning spaces accordingly. If students face problems, for instance, technical issues with slide sharing or noisy background, the online class should respect their choice, have sympathy, and offer ad-hoc technical assistance to the student.

Persistence

Regular Dialogue: The typical dialogue provided by instructors would increase students' engagement in learning tasks and interactions during the lesson and motivate them to achieve their learning goals (Edisherashvili, 2022).

Assessment Instructions: Moreover, Panadero, Alonso-Tapia, and Reche (2013) state that assessment instructions benefit students' cognitive development and persistence for more complex learning tasks. Having been clear about the assessment, the students would process better goals setting and have a deeper connection to their prior knowledge to perform the task. As a result, the students gain higher motivation to achieve the tasks and reduce their avoidance of difficult tasks or stress related to complex tasks.

Collaborative and Interactive Learning Environment: Through the collaborative and interactive learning environment, for example, asynchronous group discussion, and discussion forums, peers interactions allow students to learn about peers' cognition and other social and behavioral patterns (Edisherashvili, 2022). This can be understood that social comparison boosts students' self-esteem and encourage them to maintain their learning. In addition, according to Ma, Liu, Liang, and Fan (2020), involvement with peers during learning activities would help reduce their loneliness, especially in online learning and foster a sense of belonging to a community. Lee and Choi (2011) consider social support a significant predictor of student persistence.

Help-seeking

Students can only regulate help-seeking in the SRL process when there are potential and accessible helpers in their learning network. According to Lim, Tai, Peter, and Morrison (2020), not only help-seekers but help-givers can also foster their acquisition of self-regulated learning. By contrast, Huang and Law (2018) contend that students who asked for help the least were the ones who performed the worst in online courses. Given the challenges of help-seeking in online learning, facilitating a friendly and collaborative learning environment is vital for students to regulate help-seeking.

Time Management

There is very little existing evidence proving the relationship between instructor-provided support and students' time management in the online learning environment. Instead, the existing research findings have shown that technology-based tools, such as Learning Management Systems, could help students track their time invested in the tasks and avoid procrastination (Edisherashvili, 2022).

Advice on Planning Strategy and Time Management Skills: The instructor could provide advice on planning strategies during the preparatory phase. Particularly, with information about task strategies or recommended time that students should spend on course materials, the student can accordingly make an appropriately planned schedule and duration for their learning. Besides, the instructor and peers can also instruct time management skills to inexperienced students to help them monitor learning schedules and control themselves from distracting factors in online learning.

Providing Pacing Support: "Support for appropriate pacing might be particularly important during emergency remote schooling" (Carter et al., 2020, p. 324). Rice and Carter (2016) also maintain the benefits of pacing flexibility as additional time in emergency remote schooling because students may encounter many difficulties with the internet connection, online fatigue, and content overwhelming that constrain students from completing assignments on time. Therefore, teachers could consider the situation and adjust the due dates for assignment submission.

Set up the Online Social Norm in Communication: Ng (2021) proposes the alignment of means of communication and the appropriate time. This makes sense in the diverse living conditions of students and instructors and ensures the work-life balance.
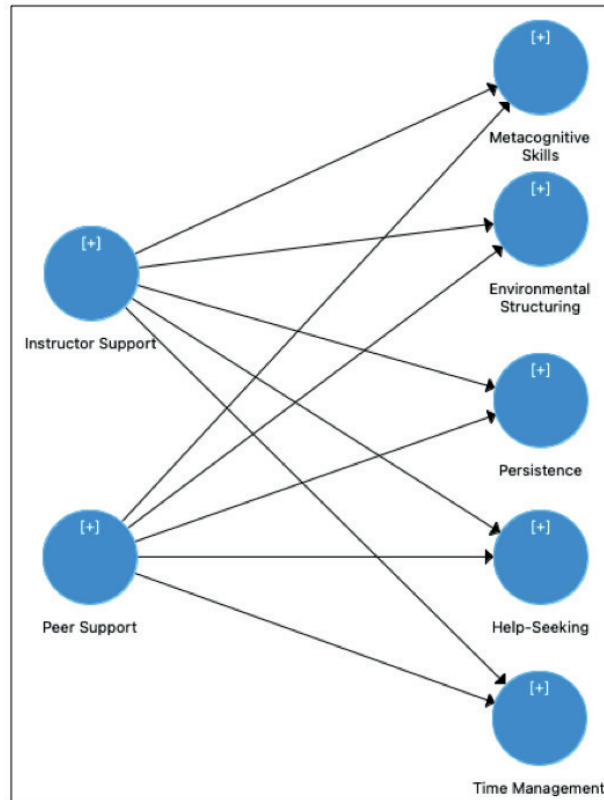
Figure 1. Research Framework

Hypotheses

H_1: There is a significant impact of instructor support and peers support on the Metacognitive skills dimension.

H_2: There is a significant impact of instructor support and peers support on the Environmental Structuring dimension.

H_3: There is a significant impact of instructor support and peers support on the Persistence dimension.

H_4: There is a significant impact of instructor support and peers support on the Help-seeking dimension.

H_5: There is a significant impact of instructor support and peers support on the Time management dimension.

METHOD

Participants

We conducted convenient surveys on 123 undergraduate and graduate students at universities in Taiwan. Students were asked to choose a course from the current online courses they have been studying during the spring semester of the school year 2021-2022 and answered the self-report questionnaire based on their experience in that course. The survey was conducted on Google Forms from 22-29 May 2022, with anonymous responses.

The questionnaires were bilingual in English and Mandarin. The finalized version in English was translated into Mandarin following the steps of forwarding translation and back translation. The translation process was performed in order by two translators proficient in English and Chinese and with education knowledge. The pilot survey was pretested on five participants to get feedback on content understanding, translation, survey structure, and other aspects.

Table 1 provides demographic information of the participants: 115, representing (93%) of the participants, were students from National Dong Hwa University (NDHU) and eight, representing (7%) were from other universities in Taiwan. Among NDHU participants, 42 (34%) were from the College of Management. Regarding the study year, 62 (50%) were first-year students. Of the pursuing degrees, 86 representing (70%) were undergraduate students.

Table 1. Demographic Information

School	Frequency	Percent (%)
NDHU - Hua-shih College of Education	21	17%
NDHU - College of Management	42	34%
NDHU - College of Science and Engineering	17	14%
NDHU- College of Humanities and Social Science & College Of Indigenous Studies	17	14%
NDHU- Center for Teacher Education	7	6%
NDHU- Others	11	9%
Other Universities	8	7%
Study Year	Frequency	Percent (%)
First year	62	50%
Second year	18	15%
Third year	12	10%
Fourth year	28	23%
Other (year)	3	2%
Pursuing Degree	Frequency	Percent (%)
Undergraduate	86	70%
Master	23	19%
PhD	13	11%
Other (Degree)	1	1%

Data Collection and Analysis

The Scales

The Instructor Support and Peers Support Scale: This scale aimed to assess the instructor and peers' support perceived by the students in online learning. The scale was adopted from Sang et al. (2011) and modified according to specific literature and the research scope. The scale has a five-point Likert format (1 = strongly disagree to 5 = strongly agree).

The sub-scale about instructor support has 15 items, covering aspects of 1) Clear expectations and objectives; 2) Syllabus update; 3) Goal orientations; 4) Regular dialogue; 5) Structured Materials; 6) Questions asking; 7) Correct misunderstandings; 8) Provide clear instructions; 9) Constructive feedback; 10) Reflective Student Survey; 11) Providing pacing support. The sub-scale had good internal consistency, α = 0.938.

The sub-scale used to assess peers support consists of seven items covering 1) Peer interaction; 2) Group discussion; 3) Peer interaction; 4) Help-seeking and help-giving, and 5) Receiving and providing peer feedback. The alpha coefficient was 0.884.

The Self-Regulated Online Learning Questionnaire (SOL-Q): The purpose of this scale was to assess self-regulated learning in online learning. Respondents respond to questions in a five-point Likert format with values ranging from strongly agree (5) to strongly disagree (1). The scale covers five sub-dimensions, comprising metacognitive skills with 18 items, time management with three items, environmental structuring with five items, persistence with five items, and help-seeking with five items. Even though SOL-Q is developed in the context of Massive Open Online Courses (MOOC), this questionnaire is "developed for fully online courses with a focus on individual learning activities, and thus transferable to similar settings" (Jansen et al., 2016, p. 20). So far, SOL-Q has been employed popularly by researchers to measure self-regulated learning in the online environment.

In the present study, the alpha coefficient values for dimensions of the Self-Regulated Online Learning were in Table 2. (*) Time management dimension has three items, of those two items are negatively worded. These are also the only negatively worded items in the whole 58-item questionnaire. The data of these two items were recorded before the step of factor analysis. The results show high homogeneity among the variances (coefficient alpha is at 0.428); however, given the importance of the time management dimension in the SRL process, it is kept for later analysis.

Table 2. The Alpha coefficient values

Dimensions of the online SRL	Cronbach's Alpha
Metacognitive skills	0.95
Time management	0.428 (*)
Environmental structuring	0.905
Persistence	0.82
Help seeking	0.858

Measurement

Factor analysis was conducted using SPSS 22.0 to discover underlying factors besides two predefined scales.

Instructor Support and Peers Support Scale: The KMO measure of sampling adequacy value was positive (0.902), and Bartlett's test of sphericity had a significance level of 0.000. The principal component analysis (PCA) results show that all variables under instructor and peers support scales had significant factor loadings on the model. However, three variances of instructor support (IS_1, IS_2, IS_3) grouped into an underlying component were eventually removed from the model because they carried out the aspects of course instructions rather than the ad-hoc support from the instructor. As a result, the instructor support scale was reduced to 12 items, and the peers support scale was kept to seven items.

The Self-Regulated Online Learning Questionnaire (SOL-Q): Despite the previous validity process by the authors and its popularity in the research market, the present study still conducted the factor analysis to examine if the underlying factors established from the gathered data are aligned with the proposed model. The KMO measure of sampling adequacy value was positive, at 0.887, and Bartlett's test of sphericity had a significance level of 0.000. After checking factor loadings, the study excluded eight variables (MS_1, MS_6, MS_9, MS-12, MS_14, MS_17, TM_2, HS_5) to the low factor loading and cross loading. All remained variables were verified to have meaningful contributions to the research.

PCA proposed seven underlying factors, while the ordinary model of SOL-Q only has five dimensions. The variables in two new proposed components (MS_7, MS_8, MS_18, PE _4, HS_4, PE_5) did not reflect a specific and distinctive dimension based on the theoretical review and thus were removed from the model.

To sum up, after the reliability and validity examination process, 14 variables were removed from the model. In the end, the final scale used to analyze self-regulated learning in online learning had 25 items: metacognitive skills with nine items, time management with two items, environmental structuring with five items, persistence with three items, and help-seeking with three items. After removing the variable TM_2, the alpha coefficient for the dimension of time management had a better result, at 0.603, and the corrected item-total correlation was higher than 0.4 for each TM_1 and TM_3. All in all, all remained variables satisfied the requirements for the later correlation and regression analysis.

Data Analysis

The study used SPSS 22.0 for the data analysis. Firstly, descriptive analysis was conducted to examine students' perception of 1) instructor support and peers' support and 2) their SRL during the temporary pivoted online learning. Secondly, correlation analysis was performed to assess the relationship between instructor support and peer support individually with dimensions of SRL. Lastly, regression analysis was employed to examine the stated hypothesis, particularly the ability of instructor support and peer support levels to predict self-regulated online learning.

FINDINGS

Descriptive Analysis

In the present research, questions were designed as an interval scale. Each combination of questions was to measure 1) instructor support and peers' support and 2) their SRL during the temporary pivoted online learning. Therefore, Means were used to evaluate the central tendency and standard deviation (SD) for the data set's variability.

In general, the overall score of instructor support, peers support, and SRL rated by students are relatively good, at 3.78, 3.41, and 3.30, respectively. Additionally, SD varied from 0.81 to 1.07, depicting that students' perceptions of surveyed aspects mostly varied among Likert responses 2 - 4 (disagree to agree). However, toward the positive side of the Likert scale. In addition, the variabilities between the dimensions were relatively even, and the difference between the maximum and minimum values was 0.26. Noticeably, in specific dimensions of SRL, time management was the least regulated aspect perceived by students (2.74), whereas the highest dimension went for the selection of learning environment (3.71).

Moreover, the analysis by demographic groups shows that students rated instructor support with higher scores than those for peers' support. Among those pursuing degree levels, master's students rated higher scores for surveyed aspects than undergraduate students and the same pattern for PhD students, meaning that the higher their study levels, the higher awareness of instructor support, peers support, and SRL capacity students perceived.

Group	Statistical	Instructor Support (IS)	Peers Support (PS)	Self-Regulated Learning				
				Metacog Skills (MS)	Environ Structuring (ES)	Persistence (PE)	Help-Seeking (HS)	Time Mgmt (TM)
Total N = 123	Means	3.78	3.41	3.48	3.71	3.17	3.43	2.74
	SD	.81	.85	.82	.99	1.02	.89	1.07
Undergraduate n = 86	Means	3.73	3.32	3.37	3.54	3.16	3.38	2.67
	SD	.83	.80	.77	.98	.92	.85	1.04
First-Year (n = 37)	Means	3.67	3.41	3.41	3.49	3.28	3.34	2.35
	SD	.78	.78	.82	.94	.95	.84	.83
Second-Year (n = 10)	Means	3.28	2.80	2.88	3.14	2.87	3.30	2.75
	SD	1.24	1.09	.81	1.00	.53	.91	1.11
Third-Year (n = 10)	Means	3.73	3.34	3.24	3.36	3.07	3.07	3.15
	SD	.81	.89	.66	1.12	.62	.70	1.29
Forth-Year (n = 26)	Means	3.93	3.38	3.58	3.89	3.19	3.62	2.98
	SD	.68	.61	.67	.92	1.01	.92	1.11
Other (year) (n = 3)	Means	4.19	3.29	3.15	3.00	2.67	3.00	2.17
	SD	.73	1.14	.68	.80	1.67	.67	.58
Master n = 23	Means	3.88	3.54	3.62	4.12	2.96	3.52	2.85
	SD	.75	1.04	.83	.88	1.22	.98	1.10
PhD n = 13	Means	4.08	3.85	4.15	4.28	3.79	3.74	2.77
	SD	.60	.63	.56	.56	.93	.81	1.09
Other (Degree) n = 1	Means	1.92	2.14	1.11	1.00	1.00	1.33	5.00
	SD	.	.	.	.	.	.	.

Correlation and Regression Analysis

The Relationship of Instructor Support and Peers Support with Dimensions of Self-Regulated Learning

Given the interval scales in the present research, Pearson correlation coefficients were generated to evaluate the relationship between instructor support, peers' support, and SRL variables. All coefficients in the Pearson correlation matrix were positive, meaning that if the instructor's or peers' support level increases, the student's SRL also increases. The interpretation of correlation coefficients in the present research was based on Senthilnathan's spectrum of correlation coefficients in social science studies (2019). According to Senthilnathan (2019), a correlation between two variables is considered reasonable when $r \geq 0.35$ or $r \leq -0.35$ and statistically significant. The results show that instructor and peers' support had a medium association with four SRL dimensions (Metacognitive Skills, Environmental Structuring, Persistence, and Help-seeking), with coefficients ranging from 0.348 to 0.507. Both instructor and peer support have important and equivalent roles in metacognitive skills at 0.468** and 0.466**, respectively. Similarly, instructor support and peers support have an equal and meaningful relationship with students' persistence in online learning (0.37** and 0.386**, respectively). In addition, the data shows that the environmental structuring dimension is more associated with instructor support than peers' support. Notably, the correlation between peers' support and help-seeking dimensions is the most significant among linear correlations in this study, at 0.507. Lastly, the correlations of time management are very low, with statistical insignificance. As stated earlier, the time-management dimension has a low score of Cronbach's alpha, meaning that the data of this dimension are homogeneous, thus causing a low correlation with other factors in the study.

Table 4. Correlation Matrix for Measurement Scales

	Instructor Support	Peers Support	Metacog Skills (MS)	Environ Structuring (ES)	Persistence (PE)	Help-Seeking (HS)	Time Mgmt (TM)
Instructor Support	1						
Peers Support	.587**	1					
Metacognitive Skills	.468**	.466**	1				
Environmental Structuring	.412**	.348**	.597**	1			
Persistence	.370**	.386**	.535**	.489**	1		
Help-Seeking	.409**	.507**	.565**	.481**	.377**	1	
Time Management	.044	.004	-.118	-.002	-.098	-.134	1

Note. **$p < .01$.

The Impact of Instructor Support and Peers Support on Student's Self-Regulated Learning

It was hypothesized that instructor and peers' support positively predict students' SRL in temporary online pivoted learning. A multiple regression analysis - stepwise method was performed to test the stated hypothesis.

H_1. There is a significant impact of instructor support and peers' support on the metacognitive skills dimension.

The result shows that collectively 28.7% of the variance of metacognitive skills can be accounted for by instructor and peers' support ($F = 24.146$, $p < .001$). Furthermore, results show that both instructor and peers support can positively predict the variation of students' metacognitive skills, particularly instructor support ($\beta = .297$, t-value = 3.092*) and peers support ($\beta = .291$, t-value = 3.035*). In conclusion, hypothesis H_1 is accepted.

H_2. There is a significant impact of instructor support and peers support on the environmental structuring dimension.

The variance of instructor support and peers support can jointly explain 19.3% of the variance of the environmental structuring ($F = 14.342$, $p < .001$). Regression analysis excluded peers support in the stepwise regression given the statistical insignificance ($\beta = .163$, t-value = 1.603, $p = .112$). The environmental structuring is predicted by instructor support ($\beta = .412$, t-value = 4.968**). As a result, hypothesis H_2 is rejected.

H_3. There is a significant impact of instructor support and peers support on the persistence dimension.

An amount of 18% of the variance in student persistence can be explained by predictors ($F = 13.032$, $p < .001$). Both types of support have important contributions to the predicted persistence with instructor support ($\beta = .220$, t-value = 2.151, $p = .033$) and peers support ($\beta = .257$, t-value = 2.517, $p = .013$). Hypothesis H_3 is accepted.

H_4. There is a significant impact of instructor support and peers support on the help-seeking dimension.

The results show that instructor and peer support constitute 27.7% of the variance of help-seeking during temporary online pivoted learning ($F = 22.959$, p < .001). Regression analysis excluded instructor support in the stepwise regression given the statistical insignificance ($\beta = .170$, t-value = 1.776, $p = .078$). The help-seeking dimension is predicted by peers support ($\beta = .507$, t-value = 6.473**). Hypothesis H_4 is rejected.

H_5. There is a significant impact of instructor support and peers support on the time-management dimension.

The partial correlations of separate instructor support and peers support on time management are negligible; as a result, regression analysis was not computed for this factor. It is concluded that H_5 is rejected.

Table 5. The multiple correlation

The online SRL variables	R2	F-value
Metacognitive Skills	.287**	24.146
Environmental Structuring	.193**	14.342
Persistence	.180**	13.032
Help-seeking	.277**	22.959
Time-management	.002	0.105

Note. **$p < .01$.

Table 6. Coefficients of regression models

SRL variables	Model	Predictor	B	SE	β	t-value	Sig.
Metacognitive Skills	1	Constant	1.693	.314		5.393	.000
		Instructor Support	.473	.081	.468	5.824	.000
	2	Constant	1.390	.320		4.346	.000
		Instructor Support	.300	.097	.297	3.092	.002
		Peers Support	.281	.093	.291	3.035	.003
Environmental Structuring	1	Constant	1.808	.391		4.627	.000
		Instructor Support	.503	.101	.412	4.968	.000
Persistence	1	Constant	1.604	.351		4.567	.000
		Peers Support	.460	.100	.386	4.599	.000
	2	Constant	1.089	.421		2.589	.011
		Peers Support	.306	.122	.257	2.517	.013
		Instructor Support	.275	.128	.220	2.151	.033
Help-Seeking	1	Constant	1.615	.288		5.604	.000
		Peers Support	.531	.082	.507	6.473	.000

DISCUSSION

Based on the descriptive analysis, it is known that students rated instructor support and peers support with relatively good results. However, instructor support had better results than peers support. Additionally, students also rated their online SRL abilities positively. In specific dimensions of SRL, learning environmental structuring and time management were the most and least regulated aspects perceived by students, respectively. Comparing demographic groups in the research, the results show that the level of SRL was positively associated with the level of the pursuing degree.

The correlation study indicated the medium relationships between instructor support and peers support individually with dimensions of the online SRL. In addition, both jointly accounted for 18% to 29% of the variance of each dimension in the online SRL process. This implies that the remained variance can be explained by sampled errors and other factors, for instance, the goals, the sense of self-efficacy, and the level of control the student has in their learning (Schunk et al., 2014) or student attitude to the studying, course quality, and learning infrastructure quality (Albelbisi & Yusop, 2019).

The regression analysis shows that both instructor support and peers support had significant and equivalent impacts on metacognitive skills and persistence in online learning. The present study confirmed the literature review that the external factors, particularly provided support from teachers and classmates, are predictive of the utilization of task definition, goal setting, strategic planning, comprehensive monitoring, strategy regulation, motivation control, and effort regulation in the online SRL process. In the dimension of help-seeking, the results demonstrated the role of peers over the instructor. The result of this study is supported by the previous findings from Karabenick and Knapp (1991) that students tend to look for peers rather than instructors when they need help. In the meantime, instructor support impacted students' actions to structure their physical learning environment. Lastly, the results show the negligible influence of provided support on time management behaviors. This could be explained by the high homogeneity among the three items of the time management sub-scale. However, the research does not eliminate other underlying reasons for this result.

The research highlights the characteristics of temporary online pivoted learning in two aspects. First and foremost, the research was conducted in the context of the emergency in Taiwan due to the third Covid pandemic wave. Moreover, the participants sampled were students who attended temporary online pivoted learning. As mentioned in the part of the introduction, given the differences in nature between this learning format and the fully online courses, stating temporary online pivoted learning in the current research is necessary to ensure the validity of the research findings in a particular type of online learning environment.

Zimmerman (1990) stated that SRL is a complex construct with a cyclical nature, meaning that per activity in each phase of the SRL process is non-linear and affects one another. In the current study, the "connectedness" (Wong et al., 2019, p. 369) can be seen in the case of the help-seeking dimension. The help-seeking items in the self-report questionnaire measured students' efforts in seeking help. However, the end purpose of help-seeking would be diverse and related to other components of the SRL process, such as emotional motivation (persistence) or academic feedback (cognition regulation). As a result, in the factor analysis, some items of metacognitive skills, help-seeking, and persistence factors were mixed and grouped into another scale. The SRL scale hence is subject to vary in the specific learning context and research population.

Limitation and Future Work

This study has some limitations. Firstly, the study's sample size is quite small compared to the number of questionnaire items due to budget constraints. For this reason, the researchers limited the scope to descriptive, correlation, and regression analyses. With more samples, we would extend the research to the Structural Equation Model (SEM) to propose a model of how provided support affects the dimensions of the online SRL. Secondly, the sub-scale time management in the SOL-Q scale has two negatively worded items that could have been more effectively applied in the context of the present study. Future studies employing the SOL-Q should consider the sampled population's sociocultural characteristics to have appropriate scale modification. Despite these limitations, the present study has still ensured its validity to the study scope, i.e., research instructor support, peers support and SRL process, as well as the levels of impact that instructor support and peers support have on the SRL process in the context of Taiwan during temporary online pivoted learning.

The research findings open up the potential for further research. First and foremost, even though students study online, physical environments are always allocated for learning and studying. These physical conditions would foster or constrain learning (Ng, 2021). With the demonstrated impact of instructors on the environmental structuring dimension of the online SRL, more studies should be implemented on how instructors and universities could facilitate to support students in regulating the physical learning contexts. Furthermore, since time management is an essential factor of the online SRL (Trentepohl & Leutner, 2022), future studies should continue to investigate the role of provided support in the time management dimension of the online SRL.

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REFUGEE STUDENTS IN OPEN AND DISTANCE LEARNING DURING THE COVID-19 PANDEMIC THROUGH THE EYES OF TURKISH TEACHERS

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ABSTRACT

This study was conducted to identify the problems faced by refugee students during Covid-19 pandemic in open and distance learning and the best examples of practices put into effect to cope with these problems cope and solutions recommended to eliminate these problems, in Turkiye. In the study, the phenomenological research design, which is one of a qualitative research method, was used. By using the criterion sampling technique, a total of 14 teachers who had refugee students were selected as the research participants. Interviews were held with the volunteer participants. The research data were collected by using a semi-structured interview form. The descriptive analysis method was used in the analysis of the research data. According to the study findings, the refugee students who did not have the necessary educational technology facilities in open and distance learning process and could not get sufficient family support felt more deeply the language problems which is experienced also by them in face-to-face education. In order to help refugee students with these problems, some school administrations provided the refugee students with tablet and computer support within the bounds of their means. In order to alleviate the effects of the problems faced by refugee students, it is recommended to provide refugee students with educational technology support, making up education and psychological support.

Keywords: Covid-19 pandemic, open and distance learning, refugee students, education technologies, parental support.

INTRODUCTION

The school makes the largest contribution to the social, cultural, and academic development of the refugee students just as in the case of other students. The school is significant leverage that enables refugee students to interact with their peers, ensures that their personalities are shaped, tempts them to seek new opportunities, and secures that the obstacles encountered by them are removed (Suarez-Orozco & Gaytan, 2010; Wal-Pastoor, 2016). It is known that these students who were faced extensively with the language barrier, did not have adequate levels of preparedness, were not psychologically healthy, were sometimes confronted with biases and discriminatory situations, and as a consequence, they experienced problems in education activities (Arzubiaga et al., 2009; Erisman & Looney, 2007; Kollender & Nimer, 2020). In recent years, especially as a result of conflicts in the Middle East and Africa, the education of refugee children has become an important problem area for many countries, especially for developed countries (Fagerholm & Verheul,

2016; Hogue, 2018; Kollender & Nimer, 2020; Naslund-Hadley et al., 2020; Taylor & Sidhu, 2012). This problem became even more obvious especially along with the migration of approximately 6.6 million people who escaped from the conflicts in Syria (UNHCR, 2021) to neighbouring countries, in particular, Turkiye, and the European countries (Fagerholm & Verheul, 2016; Kollender & Nimer, 2020; Uyan-Semerci & Erdogan, 2018). By drawing attention to the refugee students' education activities in the period of the ongoing COVID-19 pandemic in Turkiye that traditionally does not have adequate experience in dealing with refugees but is confronted with a sudden inflow of refugees, this research brings the existing problems up for discussion as well as the approaches that will likely meet these students' needs. It is known that the refugee students perform below their real potentials and lag behind their peers in terms of accessing education and receiving a good quality education service (Darmody et al., 2014; Liu et al., 2017; Meunier et al., 2013). Open and distance learning (ODL) teaching is still in effect given the ongoing COVID-19 pandemic, which leads to the need to discuss the related problems experienced by the refugee students further.

When the relevant literature is examined, it is seen that some studies (Popyk, 2021; Primdahl et al., 2021) examining the effects of the COVID-19 epidemic on refugee students have been conducted. These studies, which were carried out in European countries such as Poland and Denmark, were carried out on the social life and social communication of refugee students from different origins during the pandemic period. In the national context, the study conducted by Celik and Kardas-Isler (2020) examined the school experiences of refugee students in ODL process. This current research differs from the relevant literature by virtue of reflecting the views of teachers who undertake critical roles in ODL process for the refugee students sharing the same ethnic origin and accordingly having similar cultural attributes. Additionally, it should be noted that, as per the laws in effect in Turkiye, the Temporary Protection Status was granted to the refugees who were the topic of this research. On the other hand, as the concept of the refugee is widely used in the relevant literature and ensures the conceptual consensus on the topic, it is considered that using the concept of refugee that was also commonly preferred by the Turkish people would be a more proper approach in the research. It is known that 4 million refugees, 3.7 million of whom were Syrians, lived in Turkiye as of 2020. Around a million of these refugees were school-age children (UNICEF, 2019). These children attend the schools where Turkish citizens can be enrolled. In this context, it is believed that this research will contribute to the relevant literature in national and foreign contexts as it is a step taken to explore the refugee students' educational lives in the period of the COVID-19 pandemic in Turkiye confronted with an intense flow of migration on grounds of conflicts occurring in Syria in recent years. Furthermore, the research is also significant because of being conducted in Sanliurfa that is among the provinces hosting the largest school-age refugee population in Turkiye (UNICEF, 2019).

Following the suspension of face-to-face educational activities and the urgent launch of ODL activities in numerous countries due to the COVID-19 pandemic since 2020 (Bozkurt, 2020; Bozkurt & Sharma, 2020; Chang & Satako, 2020; Engzell, Frey & Verhagen, 2020; Gupta & Goplani, 2020), the refugee children were confronted even more with the shortcomings that influenced their development negatively. Therefore, it can be asserted that more support and cooperation are needed for the education of refugee students (Kollender & Nimer, 2020; Popyk, 2021; Primdahl et al., 2021; You et al., 2020).

ODL has become more widespread along with the suspension of face-to-face education activities in several countries particularly in the period of the COVID-19 pandemic (Bozkurt & Sharma, 2020; Daniel, 2020; Engzell et al., 2020). Therefore, children will have good quality education, ensuring that everyone has the necessary facilities in ODL activities is a non-negligible obligation (Saavedra, 2020). Regardless of whether the education activities are carried out face-to-face or via ODL, it should be secured that all students have access to educational activities, students' needs are met, and education activities are structured in a way to support student learning, are comprehensive, and promote the equality of opportunities (Bozkurt, 2020; Chang & Satako, 2020; Giannini &Lewis, 2020). However several research studies demonstrated that the refugee students did not have the necessary education facilities and were exposed to a variety of inequalities also in ODL activities carried out in the period of the COVID-19 pandemic (Adams, 2018; Anderson, 2020b; Aswathi & Haneefa, 2015; Bozkurt, 2020; UNICEF, 2020; Van-Lancker & Parolin, 2020).

Considering the factors such as the cultural capital, socioeconomic features, parental support, teacher support, state reforms and supports, attitude toward information technologies, motivation, informatics literacy, gender, geographical differences, usage autonomy, and experience (Aswathi & Haneefa, 2015), it

is evident that the refugee students will be affected by most of these factors in ODL process. For refugee students confronted with even more challenging conditions in the period of the COVID-19 pandemic, not the emergence of new inequalities but the deepening of the pre-existing ones is in effect. In ODL process, communicating with these students became harder sometimes for technical reasons and sometimes due to language problems (Garcia & Weiss, 2020; Kollender & Nimer, 2020; Primdahl et al., 2021). The social communication channels that were in place especially for teachers to interact with refugee students and their parents at least in a restricted sense started to be gradually blocked off. Thus, the teachers who have refugee students experience difficulties and cannot appeal to these students (Kollender & Nimer, 2020; Primdahl et al., 2021). This was because the solutions that were suited to the students in general but not to the refugee students' specific needs were presented in ODL activities in the period of the COVID-19 pandemic. It is known that the refugee students failed to have educational technologies such as the internet and computers that were essential to their education as the refugee families mostly had a low socioeconomic status (Adams, 2018; Kollender & Nimer, 2020). It is often put forward that, beyond technological infrastructure, the refugee students were deprived of a suitable setting where they could perform their educational activities (Kollender & Nimer, 2020) and were bereft of support from family due to their parents' economic, social, and cultural characteristics (Anderson, 2020b; Garcia & Weiss, 2020). From this point of wiev, the current research aims to explore the problems faced by the refugee students in ODL process in Turkiye and the best practices and recommended solutions for eliminating these problems.

METHOD

In this study, the phenomenological research design is which one of a qualitative research method was used. The phenomenology pattern aims to collect in-depth data about the phenomena that we are aware of but do not have a deep understanding of (Yildirim & Simsek, 2016). Phenomenological studies refer to the common meaning of a few people's experiences about a phenomenon or a concept (Creswell, 2016). In the phenomenological design, it is aimed to gain an in-depth understanding by focusing on how participants understand the phenomenon, how they describe it, and how they feel about the phenomenon. This design focuses on how people describe a phenomenon they have experienced (Patton, 2014). While focusing on people's real experiences about a certain phenomenon, prejudice and hypothetical evaluations are avoided as much as possible (Van Manen, 2007). This research tries to identify the experiences of teachers regarding the problems experienced by refugee students in participating ODL activities during the pandemic process.

Participants

As the purpose of qualitative research is to choose cases that are rich in information and experiences, small sample groups that are generally designated with a purpose are selected as the participants (Patton, 2014). As having rich experiences about the phenomenon that is the research topic is a significant criterion for the participants as per the criterion sampling technique that is one of the purposive sampling techniques (Creswell, 2016), the criterion sampling was used as the sampling technique also in this research. In this regard, the participants to be included in the research sample were required to satisfy the criterion of teaching lessons to refugee students in ODL activities performed in the academic year of 2020-2021. In this pespect, teachers who had refugee students in elementary, middle, and high schools in Sanliurfa were selected as the research participants. Hence, 14 teachers who worked at different school levels, satisfied the designated criteria, and agreed to contribute to the research were selected as the participants in the study.

Data Collection and Analysis

The data was collected by using the interview method that was used commonly in qualitative research and the semi-structured interview form that was developed by the researchers who carried out the study. Based on the review of the relevant literature and the professional experience, the interview form comprised of two open-ended questions was prepared. The first version of the interview form contained two open-ended questions, "What do you think about the problems encountered by the refugee students in ODL process?" and "To alleviate the negative effects of the ODL process, what can be done about the education of refugee

students?". A pilot study, in which interviews were held with two volunteer participants on the basis of the first version of the interview form, was performed. As per the pilot study, the question, "What are the practices developed to solve the problems encountered by the refugee students in ODL process, and how do you evaluate these practices?", was added to the interview form based on the participant teachers' practical experiences. Hence, after the final version of the interview form was prepared, the interviews were performed.

The teachers to be interviewed within the context of the research were informed about the research topic before the interview. In this respect, the teachers were told that the research received the ethical endorsement, the utmost attention would be paid to the protection of the privacy of their personal data, and the research data would be used solely for scientific purposes. The interviews were held with the teachers who agreed to contribute to the research through scheduled online meetings. The participant were given code names as P1 (Participant 1), P2, P3, and so on. Then interviews were transcribed.

In this research, the descriptive analysis method was used for data analysis. In the descriptive analysis, just as the data can be organized as per the previously identified themes, a general framework for data analysis can also be created on the basis of the interview questions. According to this general framework to be created, the data are organized. Later, these organized data are first defined and then supported with direct citations, and the obtained findings are interpreted. In this study, firstly, interviews were transcribed, and then, the files for each interview were produced. These interview files were transferred to the qualitative analysis software. In addition to the research questions, the framework themes were created for data analysis. Subsequently, interview files were read a few times and the codes about the framework themes were designated. The themes, which were created so that the designated codes would produce meaningful patterns in common with each other, were organized as word clouds. Based on the organized data, the findings and their interpretations were addressed. Finally, the findings obtained along with data analysis were supported with direct references to the participant teachers' views. All stages of data analysis were conducted by using the qualitative data analysis software.

Validity and Reliability Study

The most effective way of ensuring the validity and reliability of the data in qualitative studies is to enhance the diversity of data (Noble &Smith, 2015; Creswell & Miller, 2000; Denzin, 2009; Tobin & Begley, 2004). The analysis of the data by different researchers is accepted as one of the main ways of data diversification (Patton, 2014; Creswell & Miller, 2000). The frequent use of detailed descriptions and direct references in data analysis (Creswell &Miller, 2000) can also contribute to the enhancement of the reliability of the qualitative data. To ensure the validity and reliability of the data in this study, the data were analyzed by the two authors of this study, and also, direct references were made for the verification of the findings that were identified as the common patterns of the analyses made by the two authors. The findings were verified also with participant teachers' confirmations.

Limitations

All of the refugees mentioned in this study came from Syria. In other words, they have similar cultures and backgrounds. Comparisons can be made by conducting research studies in different regions and with different refugee groups.

FINDINGS

The findings were obtained by analyzing the participant teachers' views about the interview questions that were prepared in line with the research aim. The findings and their interpretations are as below:

Problems Encountered by Refugee Students in Open and Distance Learning

In the research, firstly, the question, *"What do you think about the problems encountered by the refugee students in ODL process?"*, was pointed to the participant teachers. The participant teachers' views about this question were analyzed and the obtained themes and codes were exhibited in Figure 1 below.
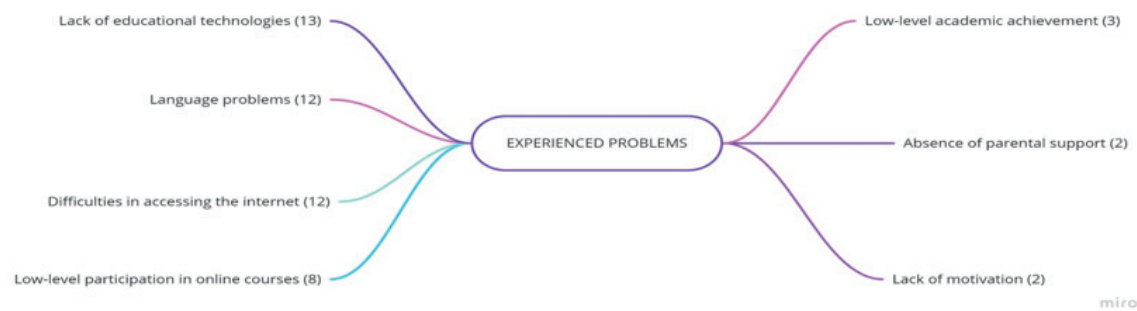
Figure 1. Findings about the problems faced by refugee students' in ODL

As viewed in Figure 1, the theme of Experienced Problems was created analyzing the participant teachers' views about the problems encountered by the refugee students in ODL. It is discerned that the codes such as 'lack of educational technologies', 'language problems', 'difficulties in accessing the internet', 'low-level participation in online courses', 'low-level academic achievement', 'absence of parental support', and 'lack of motivation' were consecutively clustered under this theme. According to the participant teachers, 'lack of educational technologies', 'language problems', 'difficulties in accessing the internet', and 'low-level participation in online courses' come at the top of the problems experienced by the refugee students in the period of ODL. The P10 who worked as a Turkish language teacher at an elementary school that had a large number of refugee students draws attention to the problems encountered by the refugee students in this framework by stating, "… in this process, the difficulty in accessing the internet and the limited number or the absence of technological devices come at the top of the problems faced by the refugee students in ODL. In certain houses, the availability of just one phone, the absence of a computer, and the presence of a TV sometimes working or sometimes not working gave rise to problems in accessing education…". Moreover, the P2 who had refugee students at a middle school and said, "… particularly the inability of a highly large part of the refugee students living in certain regions (the region where our students resided) to participate in courses because of the unavailability of internet connection or computers, tablet PCs, and so on", draws attention to the fact that the lack of educational technologies and the troubles in accessing the internet had gravely negative effects on the participation of the refugee students in online courses. As per the participant teachers' views, it is ascertained that the problems faced by refugee students in participating in online courses as a natural consequence of the difficulties in accessing educational technologies and the troubles in having internet connectivity came at the top of the challenges experienced by refugee students in the period of ODL.

According to the participant teachers, one of the key problems experienced by the refugee students in ODL process is the language barrier. The language barrier that was essentially a crucial problem faced by the refugee students also in face-to-face education was more intensely perceived as a problem in ODL period. For example, P13 says that one of the refugee students' most important problems in the period of the COVID-19 pandemic was the language barrier by stating, "… during the pandemic, our most important problem has been the communication. Not speaking the same language prevented us from understanding them…". Likewise, the P4 directs attention to the language problem experienced in lecturing to the refugee students in ODL period by telling, "… as the refugee students who already suffered from the language problem in face-to-face courses were more passive in ODL, and the effect of this negative situation increased even further. Shortly, the language problem got worse in ODL process…". As it was discerned, the language barrier that was already among the refugee students' most important problems came forward as an even more serious challenge in the period when ODL was offered. It can be asserted that the language barrier that was tackled to a certain extent with peer support, interpreter's assistance, and body language in the classroom setting under normal circumstances turned to be a serious problem for both teachers and students in online courses.

As well as the above problems, the problems such as low-level academic achievement, absence of parental support, and lack of motivation are also observed. According to the participant teachers, the refugee

students suffer from a lack of motivation and have low-level academic achievements as a natural result of the lack of educational technologies, difficulties in accessing the internet, language problems, and low-level participation in online courses. For instance, the P9 brings this situation to the fore by saying that "… together with the pandemic, their self-confidence and academic achievement levels decreased…". Also, the absence of adequate and essential parental support was deemed as one of the key problems in the context of the lack of motivation and low-level academic achievements in refugee students. The P10 draws attention to the absence of parental support with views suggesting, "… it was observed that a large majority of the refugee families could not support their children about their courses as they did not know Turkish, and this situation, in turn, led to the fall of motivation in refugee students…". It can be said that the refugee students' parents failed to provide their children with necessary educational support due to economic challenges, lack of educational qualifications, and language problems.

Best Examples of Practices Put into Effect as the Solution of Problems Encountered in Open and Distance Learning

In the research, secondly, the question, "What are the practices developed to solve the problems encountered by the refugee students in ODL process, and how do you evaluate these practices?", was asked to the participant teachers. The participant teachers' views about this question were examined and the obtained themes and codes were indicated in Figure 2 below.

Figure 2. Best practices put into effect as the solution of problems encountered by refugee students in ODL

For the solution of the problems experienced by the refugee students in ODL process, the theme of Examples of the Best Practices was produced upon the analysis of the participant teachers' views about the practices developed by the schools. It is ascertained that the codes such as 'Education Informatics Network (EIN) support point', 'language support', 'communication & collaboration', and 'educational technologies & materials support' were successively clustered under this theme. For instance, the P10 who worked as a Turkish language teacher referred to the best practices developed at the school to solve the problems experienced by the refugee students in ODL with views proposing, "… the constant communication of the school administration with the refugee student, teacher, and the parents and the easy access to the school administration itself facilitated this process. At our school, the school administration created EIN support points for children that had no internet access or asked for support. Our students benefited from these support points. Materials that would be useful to the students were offered to them. Our school administration followed up with our students on every topic in collaboration with students' parents. In this process, with our guidance service, psychological support was extended to our students and their parents…". Another participant teacher, the P3, highlights that a variety of practices such as the educational technology support aimed at the refugee students and the EIN support points for internet access were developed at the school by stating, "… our school distributed tablet PCs to some refugee students within the bounds of its means and resources. Of the students who obtained tablet PCs, those with an internet connection could join the live courses while those without it utilized the internet service at the school when they could come to school. Of course, these facilities are not sufficient because there is a large number of refugee students who cannot participate in educational activities as they still cannot have access to technological facilities…".

Moreover, the P4 stated that the practices developed at the school were aimed at solving the problems experienced by the refugee students in ODL by telling, "… as I just said, the infrastructure and language problem came at the top of the challenges faced most by the refugee students during the pandemic. In an effort to solve problems on the topic of infrastructure, the EIN support point was established in our school to facilitate the access of our students to ODL. Moreover, to solve the language problem, the Turkish language teacher offers Turkish language courses outside the school hours again via ODL…".

Upon the review of the participant teachers' views, it was identified that various examples of the best practices were developed at certain schools for the solution of problems experienced by refugee students in the period of ODL. Furthermore, it was found that the examples of the best practices were, in particular, to provide the support of educational technologies such as computers and tablet PCs that were indispensable for participation in online courses, to establish EIN support points that would offer internet connection and technology support, to be in constant communication and collaboration with students and their parents, and to provide material support.

Solutions Recommended to The Problems Faced by The Refugee Students in Open and Distance Learning

In the research, lastly, the question, "To alleviate the negative effects of the ODL process, what can be done about the education of refugee students?", was directed to the participant teachers. The participant teachers' views about this question were analyzed, and the obtained themes and codes were exhibited in Figure 3 below.


Figure 3. Solutions recommended to the problems faced by the refugee students in ODL

As observed in Figure 3, the theme of Recommended Solutions was created by analyzing the participant teachers' views about the alleviation of negative effects of the ODL activities on refugee students during the pandemic. It is discerned that the codes such as 'communication & collaboration', 'educational technologies & internet support', 'language support', 'organization of remedial education in the post-pandemic period', 'face-to-face education', 'arrangement of social activities in the post-pandemic period', and 'course materials support' were respectively clustered under this theme. Figure 3 demonstrates that various recommendations were developed by the participant teachers to alleviate the negative effects of the pandemic on refugee students. 'Communication & collaboration', 'educational technologies & internet support', and 'language support' come at the top of the recommendations proposed to alleviate the negative effects of the pandemic on refugee students. For example, the P1 emphasizes the necessity of having communication and collaboration with refugee students' parents to alleviate the negative effects of the pandemic on refugee students by telling, "… by being in communication with the students' parents and informing them in advance about the setbacks to be created by this process, we can raise awareness…". The P10 states that the school staff should be in collaboration with refugee students' parents by communicating with them via interpreters during the pandemic by saying, "… student's self-belief should be increased. By preparing course programs for students, it should be ensured that especially the children from crowded families would study on a regular basis. Constant communication with student parents should be put in place to have communication with students' parents with the help of an interpreter and to explain properly what the students should do in this

process, the importance of the process, and the duties assigned to the parents…". It can be asserted another participant teacher, the P14, who states, "… learning the expectations and needs of refugee students and their families about the school through surveys to be applied via ODL to the refugee students for identifying their needs, efforts can be made in this direction…", points to the importance of the communication and collaboration to be established between the school and refugee students' parents also for learning the expectations of both the students and their parents. Besides, via the communication and collaboration to be established with refugee students and their parents, psychological support can also be offered for a variety of problems caused by the COVID-19 pandemic. For example, the P11 calls attention to this situation by saying, "… the instructors speaking the same language as the refugee students can provide psychological support …".

According to the participant teachers, providing educational technologies and internet connection support is of great importance for the alleviation of the negative effects of the pandemic on refugee students. For instance, the P2 refers to the importance of providing educational technologies and internet connection support by telling, "… first of all, material problems should be overcome and it should be borne in mind that a very large part of the refugee students who could not participate in ODL failed to attend these courses due to circumstances such as the lack of computers, tablet PCs, and internet connectivity. It is obligatory to provide refugee students with technological materials…". Likewise, by saying, "… in this process, of course, providing internet connection, tablet PCs, and TVs is the most important support…", the P9 sets forth that providing educational technologies and internet support such as computers, tablet PCs, and TVs would be important to the alleviation of the negative effects of the pandemic on refugee students.

One of the participant teachers' recommendations to alleviate the negative effects of the pandemic on refugee students is to provide the refugee students with language support. For example, the P4 stresses the importance of providing language support by telling, "… the problem most frequently encountered by the refugee students outside the period of the pandemic was the language barrier. As the students were away from the classroom setting, the process of learning the language was hampered even more for them. To make up for this situation, offering face-to-face supportive Turkish language courses to these students will be more in line with the realities and more beneficial…". Likewise, while the P14 underlines the importance of language support by saying, "… educational materials likely to help refugee students learn the Turkish language can be offered to the students through the channels of ODL…", the P8 points to the necessity of providing additional Turkish language courses in the sense of language support by telling, "… extra Turkish language courses for refugee students should be offered at least via ODL…".

It was identified that other recommended solutions developed by the participant teachers were to organize remedial education in the post-pandemic period, to offer streamed face-to-face education for refugee students, to arrange social activities in the post-pandemic period, and to provide refugee students with course materials support. For instance, the P11 states his/her views by saying, "… when face-to-face education starts again, remedial education programs can be planned to eliminate refugee students' academic shortcomings…". Similarly, it can be asserted that the P8 referred to the importance of planning remedial education programs in the post-pandemic period to overcome learning shortcomings by telling, "… when face-to-face education starts again, firstly, the additional courses should be held to overcome the learning shortcomings…".

In the research, the participants were asked about the problems experienced by refugee students during the ODL process, examples of good practices used in solving these problems, and their suggestions for solving the problems experienced. To sum up, the main problems that refugee students experience in ODL process are the lack of educational technologies, language problems, internet access difficulties, low participation, low academic achievement, lack of parent support and lack of motivation. Examples of good practices applied in solving these problems are the EBA (Educational Information Network) support point, language support, efforts to improve communication and cooperation, educational technologies and material support. It has been determined that participant suggestions about the solution of the problems encountered by refugee students are increasing communication and cooperation, educational technologies and internet support, language support, organizing post-pandemic remedial trainings, face-to-face training, organizing post-pandemic social events and course material support.

DISCUSSIONS AND CONCLUSION

The economic inequalities across the world have repercussions on the digital world and give rise to serious gaps in terms of accessing communication technology. While some people struggle with poverty, some others benefit from the advantages offered by communication technologies. These differences have implications also on educational activities and those capable of accessing the sources of information and communication gain advantages whereas those failing to do so lag behind (Tiene, 2002). ODL activities performed during the period of the COVID-19 pandemic assumes that the refugee students like all other students can have access to internet networks, digital devices, and communication platforms. However, this is not necessarily the case for refugees and refugee students most of the time (Primdahl et al., 2021). The refugee students who are faced with difficulties in educational processes even in normal times are likely to be confronted with more challenges in ODL activities. Considering the nature of ODL, technological infrastructure needs such as computers, tablet PCs, and internet connectivity come to the fore as issues influencing student participation in ODL (Edmonds & Flahault, 2021). Therefore, as well as educational activities performed online via digital platforms by taking into consideration the families' circumstances, the radio & TV contents, reading materials, approaches with a lower technology content including homework assignments, and the development of more flexible ODL methods can help to eliminate learning setbacks and motivate students (Adam, 2020; UNICEF, 2020; Giannini & Albrectsen, 2020; Giannini & Lewis, 2020; Saavedra, 2020). In this situation, the support to be extended to the refugee students who do not have educational materials particularly due to the economic shortcomings is valuable. At this point, some countries take certain measures. For instance, China gives computers and mobile internet to students from low-income families while France lends devices to students who do not have access to the internet or computers. Besides, Portugal supplies such students with study sheets by mail (Chang & Satako, 2020). In this sense, the delivery of 500 thousand tablet PCs to the students having difficulties in terms of accessing ODL activities during the pandemic in Turkiye (Ministry of National Education of Turkiye, 2020) can be perceived as a significant contribution. Increasing and expanding such sorts of support are deemed important. Additionally, efforts can be made to ensure the more active use of the EIN support points established at schools for students, who cannot access the EIN platform, such as refugee students (Ministry of National Education of Turkiye, 2020). Moreover, digital education contents such as videos, audio records, animations, enriched e-books, and educational games are offered to the students via the EIN platform. Activity books, test books, and study sheets designed for students were prepared and made available to all students in digital format on this platform (Ministry of National Education of Turkiye, 2020).

Low-level participation in ODL activities as a consequence of the shortcomings related to education technologies and internet connectivity takes attention. In several studies (Basar et al., 2018; Day-Vines & Day-Hairston, 2005; Garcia & Weiss, 2020), it is put forward that the refugee students had higher school dropout and absenteeism rates than other students also in the period of face-to-face education. Particularly the refugee students' tendency to break away from the school are likely to go up during the pandemic. In this case, through the establishment of communication with the families of students who do not join ODL activities, focusing on students' excuses for not attending ODL activities and the things that can be done on this issue can make a difference. At this point, it cannot be ignored that establishing communication with a group of people such as the refugees that speak different mother tongues and have problems relevant to daily life is hard. This is the case because refugee students' families are more likely to struggle with health problems, heavy workloads, and economic hardships. Thus, the children of these families can be confronted with more difficulties as they are deprived of family support in an educational sense (Anderson, 2020b; Bruckauf, 2016; Bruckauf et al., 2016; Garcia & Weiss, 2020). Previous research demonstrates that the support given by the migrant and refugee parents to their children's educational lives was limited as the migrant and refugee parents were not familiar with the local education system and had low-level language proficiency most of the time (Anderson, 2020a; Darmody et al., 2014; Garcia & Weiss, 2020; Saavedra, 2020). Additionally, whether the parents are well-equipped to make interventions to fill in the gaps likely to be experienced in education activities in ODL process makes an effect. In this context, it can be said that the support to be given by the refuge families, which most of the time lag socially and culturally behind the host society, to the education process of their children will be limited in scope (Edmonds & Flahault, 2021; Garbe et al., 2020). Despite this limited support, the positive implications of the strong communication between parents, teachers, and school administrators are valuable as the educational support given by the parents to

refugee students can make significant differences as in the case of local students, and hence, strengthening this communication network should be encouraged (Peterson & Ladky, 2007). As well as the social isolation and limited communication in the period of the COVID-19 pandemic, the inability to perform daily life routines along with the closure of schools that are the socialization places especially for refugee and migrant students can bring about certain risks such as dropping out of school (Garcia & Weiss, 2020; Popyk, 2021; Primdahl et al., 2021; You et al., 2020). At this point, the individualized programs to be designed for refugee children, consultancy to be offered for coping with social isolation and exclusion, and the satisfaction of certain needs such as understanding the education system in the host country can be of use.

It is widely acknowledged that the refugee or migrant children learn the basics of the mother tongue of the host country first, and only after learning these basics, they join the standard classes at the school. If the children learn the basics of the language of the host country and are exposed to their peers' effects, then the acquisition of a language by them can be accelerated (Koehler & Schneider, 2019). The inadequacy of refugee students' language skills can negatively affect their academic performance as well (Bruckauf, 2016; Edmonds & Flahault, 2021). In research studies, it is often noted that the refugee or migrant students often had low-level academic performance (Darmody et al., 2014; Entorf 2015; Orozco et al., 2009; Simsir & Dilmac, 2018). Considering that the ODL activities are not, by nature, in line with the variations in refugee students' existing language proficiency levels (Primdahl et al., 2021), it can be asserted that the language problems experienced in face-to-face education activities will have deeper impacts on ODL activities.

The emotional, psychological, and behavioral states of the students who were closely engaged with ODL at home for a long time during the pandemic might have been affected negatively (Awasthi, 2020). To support the establishment of close relations and strong ties between parents and children, protect their psychological resilience, and enhance their mental well-being, educational sets and guidelines were prepared and published in Turkiye by the Ministry of National Education (Ministry of National Education of Turkiye, 2020). Numerous countries such as China, Japan, Spain, and the USA try to provide such sorts of support by establishing various channels (Armitage & Nellums, 2020; Giannini & Albrectsen, 2020; Chang & Satako, 2020). To provide better and more effective solutions in ODL process, cooperation can be made with different stakeholders (psychologists, sociologists, therapists, and so on). It should be kept in mind that the students would recall not only the contents of the educational activities but also the psychological states that they had in these hard times (Bozkurt & Sharma, 2020). Considering that the children who stayed at home for months were distant to the socialization channels away from their friends and teachers (Giannini & Albrectsen, 2020; Chang & Satako, 2020), it is important that the education institutions support students and their parents by communicating with them frequently in this process (Daniel, 2020). Besides, placing the guidance services in the first place, the need felt for psychological support to be offered particularly to refugee students at the school level during the pandemic and in its immediate aftermath should not be neglected.

Recommendations

The inability of all students to benefit from face-to-face education opportunities during the COVID-19 pandemic period brings along various problems. It can be considered as a general result of this research that refugee students are among those most affected by these problems due to the Covid -19 outbreak. It should not be overlooked that refugee students are faced with disadvantageous situations such as not being able to have technological opportunities at a time when these facilities are indispensable, not being able to receive adequate family support in a critical period when they need family support, and as a result, experiencing even greater difficulties, the language problems. It is essential to develop effective policies to compensate for the educational disruptions that refugee students are exposed to during the ODL process. In this context, it may be recommended to start remedial courses first in order to fill the academic gaps that deepened after the start of the pandemic. Developing policies by policy makers that take into account the specific problems faced by refugee students such as technological deprivation, language problems, lack of motivation and low participation can be effective in closing this gap. In addition, it may be beneficial to initiate studies to produce measures for the absenteeism and dropout tendencies that refugee students may develop in the post-pandemic period. On the other hand, when it comes to suggestions for researchers, this study was conducted according to the views of teachers. Different studies can be carried out on the basis of the opinions of refugee students and their parents.

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TEACHERS' COMPETENCIES AND STUDENTS' ATTITUDES TOWARD ICT AT AN EFL SECONDARY SCHOOL

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ABSTRACT

Teachers as educators should have adequate competency in using a variety of media and knowledge to deliver the information to their students in order to use information and communication technologies (ICT) effectively. This study explores teachers' competencies of ICT in their teaching and students' attitudes toward ICT in learning English. Three English teachers and their 90 students of eleven graders at one secondary school in one district in East Kalimantan participated in this study. The data were gathered from semi-structured interviews, observations, and questionnaires. Using a qualitative approach design concerning phenomenological perspective, the content analysis results have revealed that approximately 70% of the students had a positive attitude toward ICT, while the teachers' competencies were varied from mostly incorporating all the ICT tools to rarely using them in their classroom. The results suggest that English teachers need to have more professional development programs related to ICT in order to understand and be able to operate the ICT media and tools to teach English. EFL students should aware of their attitude toward ICT in this modern era and firmly use the advancement of ICT for educational purposes.

INTRODUCTION

The use of information and communication technologies (ICT) in the 21st century is undeniable that requires educators and students to use it actively and effectively. In order to use ICT effectively, teachers as educators should have adequate competency in using a variety of media and knowledge to deliver the information to their students. This ability or knowledge can facilitate them to make more creative ideas in teaching and enjoyment also the excitement of students in the class (Kereluik et al., 2011; Oliver & Short, 1996; Sundqvist et al., 2021).

With the rapid growth of the ICT, the term literacy in education that traditionally refers to an ability to write and read written language has been extended into ICT literacy. This extension is a broader concept of information literacy which represents the fundament for modern society development (Ivankovic et al.,

2013). ICT literacy as an individual concern to employ ICT devices in order to effectively take part in society with five components, namely access, manage, integrate, evaluate, and create (Ainley et al., 2007; James, 2001; Lindlof & Taylor, 2017; Panel, 2002; L. Simulwi & Musonda, 2020). Further, Educational Testing Service Panel (2002) has emphasized that "ICT literacy skills are becoming increasingly important not only for nations to maintain or improve their standard of living but for the well- being of individuals as well (p.17).

Hew and Brush (2007) explained that ICT use in general terms is any use of "computing devices such as desktop computers, laptops, handheld computers, software, or Internet in schools for instructional purposes" (p. 225). In a specific term, ICT can be defined as using technology by teachers for instructional planning, instruction, and technology as a learning resource for students (Chen et al., 2019; Inan & Lowther, 2010). EFL teachers use ICT tools for preparing teaching materials and activities to be used in teaching pronunciation (Yoshida, 2018), grammar (Al-Jarf, 2005), vocabulary (C. Lim et al., 2003), listening and speaking (Hochart, 1998), communication skills (Lee, 2002), reading (Akyel & Ercetin, 2009), and writing (Chikamatsu, 2003). They use technical instruments, such as PCs, laptops, or mobile devices in classrooms, for instructional delivery very effectively and regularly. Learning software prepared by teachers/students or commercially created ones, such as exercises, tutorials and computer-based activities, are used in classrooms to facilitate collective learning of English skills (Beatty & Nunan, 2004). In addition, EFL teachers use computer-mediated communication (CMC) or software as a resource for practical and substantive communication (Mahfouz & Ihmeideh, 2009). Across this way, technology will provide students with a variety of credible resources and activities that positively affect their learning to be more independent and autonomous.

Current ICT literacy education needs to promote skills that improve the adaptability of learners, information and skills transition to new contexts, and the ability to learn in a rapidly evolving environment (Ala-Mutka, 2011; Ferrari, 2013; Kim, 2020; J. E. Lawrence & Tar, 2018). To accomplish these criteria, teachers need to have adequate competencies and use teaching methods appropriate for evolving knowledge and societies in this digital era, as stated in the UNESCO ICT for Teachers 2013 (Midoro, 2013).

Research on ICT has indicated some benefits as this will lead to equal access to education, educational equality, quality learning and teaching, professional development of teachers and more effective management, governance and administration of education (C. P. Lim et al., 2020), including in Indonesia (Djiwandono, 2019; Suherdi, 2019). Technology has the potential to provide opportunities for an effective teaching and learning environment (Hermans et al., 2008; Reyna et al., 2018), affect students' learning (Concannon et al., 2005; Sundqvist et al., 2021), improve learning motivation (Kjellsdotter, 2020; Mahdizadeh et al., 2008), and develop more critical thinking and autonomy (C. Lim et al., 2003; Wu et al., 2019). Although most research has identified the benefits of the technological use, research by Xiao and Sun (2022) yielded slightly different. Their investigation with 4,838 students from PISA 2018 data identified that 79.44% of students moderately used ICT for all purposes at home and at school. They managed to have well-balanced time arrangement for using ICT for academic purposes and non-academic purposes. Meanwhile, 20.56% of students revealed to have less excessive ICT use for entertainment at home.

The use of technology in learning is also related to motivation and technological anxiety. Magen-Nagar and Shonfeld (2018) investigated the impact of an online collaborative learning on students' attitude with 92 master students using intervention procedure. They found different results between the intervention and control group. In the intervention group, the students' intrinsic motivation affects the relationship between the collaboration and technological self-confidence and technological liking. Meanwhile, in the control group, motivation is not a mediator for technological anxiety. They underlined that although the students were unfamiliar with the advanced technology but eager to learn collaboratively, they would be able to decrease technological anxiety and to use advanced technology.

The use of technology for teachers could be respected as the teacher's competencies. According to Indonesian Law No 14, 2005 about Teachers and Lecturers (Regulation, 2005), teachers need to have four competencies; pedagogical, personal, social, and professional competency required through professional education. Pedagogical competence refers to the ability of the teachers to manage to learn, such as the ability to plan a teaching and learning program, the ability to communicate or control a learning process, and the ability

to make an evaluation using all forms of media and resources. Teachers' personal competency as educators is their good personal characteristics highly impact on the success of learners' development since their main task in teaching. Professional competence requires teachers to master the subject profoundly, involving experience in their areas of knowledge or mastery of the materials to be learned by the process, a sense of obligation and duty to other teaching colleagues. Social competence deals with the ability of the teachers to connect and engage efficiently and effectively with their students, fellow teachers, parents/guardians of students, and the wider community. This social knowledge requires social management skills and social responsibilities. Based on the definitions of the competencies, when the teachers apply technologies in their teaching and learning, they have fulfilled the required competencies.

Teachers' competency related to ICT means that teachers are both enthusiastic and confident in using ICT to support teaching and learning English in the class. Therefore, the competency level of ICT teachers is essential to support the delivery of material to their students in the teaching and learning process (Malinina, 2015). The competencies may range from the basic level of proficiency to the highest level of excellence (Agyei, 2021; Chen et al., 2019; Chisango et al., 2020; Simulwi & Musonda, 2020).

Research on teachers with ICT competence has revealed that teachers perceived positively the use of ICT in education. Sundqvist et al (2021) conducted a study with 161 teachers of secondary schools in Finland to investigate direct and indirect effects of teacher and school-level factors on using ICT in Home Economics (HE). Using SEM analysis, the study demonstrated that perception of usefulness, age, and digital competence are significant factors for teachers in the use of ICT. It was also found that the correlation between teachers' beliefs and ICT teaching practice, and the importance of supporting the teachers to become aware of the potential ICT to improve students' achievement.

Chisango et.al (2020) investigated teachers' perceptions of using ICTs in teaching and learning at some rural secondary schools in Eastern Cape, South Africa. Fifteen teachers from three schools participated in the investigation. Using thematic analysis, the findings showed that the teachers had a positive perception of the use of ICT in their teaching and learning and those who knew the benefits of using ICT were the ones who were ready to adopt technology in education. Further, it was found that some teachers still held traditional teaching methods and were resistant to the adoption of technology in their teaching as they have insufficient ICT knowledge and skill. Besides, lack of ICT training and ICT infrastructure hinders the schools from being exposed to technology.

Although teachers have positive perceptions toward the use of ICT, they encountered some challenges. Teachers still lack in ICT use because of limited spare time for ICT use and their perspective of unnecessary use of ICT. They only used ICT if the subject required to develop an imagination of the students by watching movie or listening an audio (Zanzali & Kassim, 2010). Teachers took time to learn and transfer ICT knowledge and skills to put into practice with their students (Agyei, 2021). They lacked confident to apply ICT in their teaching (L. Simulwi & Musonda, 2020) therefore they have limited integration of ICT into their teaching (Asik et al., 2020). They did not think that applying ICT to teaching was helpful although they had good competence to apply it. They had low motivation to use ICT to assist their teaching and only used ICT to assist teaching sometimes in few teaching contexts (Chen et al., 2019).

Simulwi and Musonda (2020) examined compulsory computer studies (CS) on information and communication technology (ICT) literacy in secondary schools in Zambia. It focused on the availability of specialised ICT teachers and ICT equipment and infrastructure, and the impact of compulsory ICT. The findings revealed that there were insufficient specialised ICT teachers, some teachers had completed short courses in ICT that helped them to have general knowledge in the subject, and a well-organised training programme is necessary for teachers in any subject area. Furthermore, eight teachers perceived that their skills and competences in ICTs were "above average" (30%) and 18 were "average" (70%) and none indicated "below average".

Lawrence and Usman (2018) explored factors that impact on teachers use in the adoption and integration ICT in teaching and learning process with four teacher educators in Nigerian context. Using semi-structure interviews in a case design, the findings showed that all teachers have positive attitude towards the use of ICT. The use of ICT is strongly depended on three factors: teacher-level factors, technological, and institutional factors. Teacher -level factors include teachers' characteristics such as age, gender, educational

experience, knowledge of ICT, and attitude towards ICT. Technological factors consist of compatibility of ICT, benefits of using ICT, perceived usefulness of ICT and perceived ease of use of ICT in carrying out teaching and learning activities in the classroom. Institutional factors link with leadership support and resources. The study found that the barriers are teacher-level barriers and institutional-level barriers. The teacher-level barriers refer to insufficient ICT knowledge, lack of time, resistance to change and complexity of integrating ICT. The institutional-level barriers cover includes limited of infrastructure, lack of training, lack of access, and lack of technical support

The literature and previous studies have indicated the importance of the use of ICT in teaching and learning, therefore this study attempts to explore the teachers' competencies and the student's attitudes towards ICT. The following research questions are used to guide the study:

1. What are the teachers' competencies toward ICT for English teaching practices at secondary school?
2. What are the student's attitudes toward ICT in learning English at secondary school?

CONTEXT

It is crucial to present the English material to the students at senior high schools in innovative ways. The era that teachers face now in the 21st century is when the students are commonly familiar with many kinds of tools related to the ICT. Teachers in this era should follow the advancement of technology by integrating ICT media in the classroom in presenting English material to the students. The researchers' concern about the competency of English teachers and students' attitude toward ICT within their teaching-learning process in English subjects. One of the researchers had identified that many English teachers lack ICT competence is proven by one of the researchers when one of them joined the initial assessment from Cambridge University for the English Teachers in one district of East Kalimantan (well-known as East Borneo). There was a session where the teachers had to register via email and log in as a member to the official website of Cambridge. The researcher found that many English teachers did not have an email address and had difficulties accessing the Internet.

Related to the education field in this research context, especially at state senior secondary levels, the schools have adequate ICT facilities, while some private schools lack ICT resources. However, adequate ICT facilities do not guarantee that ICT use is optimized even though the schools are in the wealthiest regency. This condition is due to the teachers or students' lack of competencies and attitudes toward ICT due to infrequent use of the provided ICT media at schools. Therefore, the researchers would like to investigate the teachers' competencies and students' attitudes towards ICT in this context.

In this present study, the researchers were interested in exploring teachers' competencies at one of the secondary schools in one district in East Kalimantan claimed as a favorite school due to high discipline and excellent education system and owns adequate ICT facilities in the school like Wi-Fi, computer and language laboratory, projector tools, interactive whiteboard, and other ICT equipment's. This study was conducted prior Covid-19 pandemic; therefore, the context was still in the classroom setting.

METHOD

Design

This research used the qualitative approach concerning the phenomenological perspective. In the view of phenomenological, the researchers attempted to understand the meaning of events about people in certain situations (Hatch, 2002). The methodology and data collection methods are based on two important considerations; the nature of the research and available time to conduct the research. This research was interpretative and the qualitative approach was used to understand better the phenomenon under the study (Shank, 2006). Moreover, the data, which directly quoted or described, were gathered from a small number of people (Labuschagne, 2003).

Participants

The participants of this study were three English teachers; one male and two females, aged 30-45, over seven-year teaching experience; and their 90 students of eleven graders at one secondary school in one district in East Kalimantan. A purposive sampling strategy was used. This research focused on the teachers' competencies and the students' attitudes toward ICT in teaching and learning English. The data were gathered from semi-structured interviews, observations, and questionnaires.

Once permission from the Head of Education Department, the principal and the school's teachers were approached. They were informed about this study, their involvement during the study, and the confidentiality of the study. The need for students' participation to respond the questionnaires were also explained. Next, participation and consent forms for the teachers and their students were also distributed. The forms were gathered a week after the distribution. Further, time for teachers' participation in the interviews was scheduled, including the schedule for questionnaire distribution for the students.

Instruments

Research instruments used to gather the data were interviews and observations for teachers and questionnaires for students. A semi-structured interview was employed in this study. Hatch (Hatch, 2002) explains that the researchers come to the interview with guiding questions in the semi-structured interview. During the interview process, notes were taken. The researchers used guidance questions and probed to follow up on comments made by the participants or get clarifications about responses to get more detailed information from the interviewees (Hatch, 2002). The interview focused on components of ICT competencies and criteria from ICT competency standards for teachers from UNESCO (Midoro, 2013). The interview questions were related to technological pedagogical content knowledge (TPACK) competence and confidence of Australian teachers (Albion et al., 2010) to measure their competence using ICT software and hardware and the ones adopted from previous research (Zanzali & Kassim, 2010) by considering competencies in ICT.

The observations were used to support the data from the teachers. The observations were conducted when the teachers taught in the classrooms focusing on their competency through the media, they used in their teaching English. The researchers used the observation guideline and took some notes while observing to gain more in-depth data.

The questionnaires were distributed to students to investigate students' attitudes. The questionnaires were adapted from Fisher (2000) about computer attitude. Since this questionnaire was already validated and had been used for many studies, hence the researchers adapted this questionnaire into this study by changing the subject from only computer to the ICT. There were 25 items in the questionnaire including positive and negative statements of students' attitudes toward ICT (Fisher, 2000). The positive statements were scored 4 for strongly agree, 3 for agree, 2 for disagree and 1 for strongly disagree; meanwhile, negative statements were scored the other way around. Table 1 shows the distribution items for positive and negative statements:

Table 1. The distribution of positive and negative statements in the questionnaire

Statement	Number of Items
Positive	1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 15, 16, and 18
Negative	10, 11, 12, 13, 17, 19, 20, 21, 22, 23, 24, and 25

The questionnaire statements were then translated into the Indonesian language to avoid misunderstanding. The translation was tried out to other ten students who were excluded from the participants involved in this study. One of the researchers conducted the try-out by accompanying the students while doing the try-out. Any vague statements were clarified and corrected.

Data Analysis

In this research to analyze the data the researchers used content analysis (Fraenkel et al., 2012) following the flow diagram by Miles and Huberman (1994). The flow models include three concurrent flows of activity, namely: data reduction, data display and conclusion drawing/verification. The researchers needed to familiarize with the data. The interview data were transcribed. The transcription was then returned to the teachers to ensure that the information in the transcription was the one they would like to inform. Following this, the researchers needed to go through the transcribed interview data, started making notes and began to make some marks of initial codes. Next was making initial codes. In this stage, the researchers started to generate initial codes the teachers' competencies towards ICT focusing on the five competencies. After all the initial codes were generated, then looking at all the codes and making them into the list were conducted. Similar codes which were similar to particular teacher's competency were then compiled, leading to a theme. The generated themes were read and reread to ensure that the themes covered the codes had been made. Finally, defined the themes was completed.

The observation data as the supporting data of the interviews followed similar stages of interview analysis. The field notes were collected and read and reread. Making preliminary notes and marks of initial codes were completed. All the codes were listed, and similar codes were assembled into a theme.

The questionnaires of student's attitudes towards ICT were analyzed using simple statistical analysis of percentage. They were classified into extremely positive (81-100), positive (66 – 80), ambivalent attitude (56 – 65), negative attitude (41 – 55) and extremely negative attitude (25 – 40) (Kaur, 2011).

FINDINGS

Generally, it was found that students have a positive attitude towards ICT. The average positive responses were about 90%. They indicated they could find new things in studying English with ICT (96%) and feel ICT allows them to do more exciting and imaginative English learning (90%). The positive responses mainly were given to the statements that the students could do many things about English by using ICT (99%), and they are confident about solving the problem of ICT with one and another way (94%). Then the students expressed that ICT could help them organize their English project or assessment (97%).

Many students expected to use ICT (87%) regularly (70%) and could do anything with it (83%) while received the English lesson in the classroom. They believed ICT could enhance their achievement (89%) so that they could be justified to put an extra effort into learning English. The students gave positive answers that they would be happy to use ICT and subjects from the internet (75%) to explore more information of ICT sources as a self-learning (78%). Only one negative answer of all positive statements given by students that most of them still need the assistance of using ICT means that they have less confidence in their ability, proven by 63% of the students do not agree with item number 18.

The questionnaire results from negative items were varied from 50% to 80%. The students did not expect to have network problems (69%) and errors in finding credible resources (53%) while using ICT for English study. The students disagreed if they would face outdated hardware/software (59%) and insufficient resources (55%). Most of them believed that they were in complete control when using ICT in the study (65%), but they still needed experienced friends nearby while using ICT (66%). Unexpectedly, the rest of the negative statements received positive answers, they did not feel apprehensive about using ICT in the classroom (77%), and they needed ICT to do great work (74%). 61% of students seemed to be not hesitant to use ICT without considering making a mistake that they could not fix. They disagreed if using ICT media and tools only if they were told to study English (80%), they would not avoid learning English even though they knew that it would be involved ICT (81%), and they would not avoid contact with ICT in study English (89%).

From the questionnaire results, the researchers finally gave scores for each of their answers toward the statement reflected their attitude in using ICT to study English. According to the rating score, the classification is presented in the following diagram, Figure 1.

Percentage
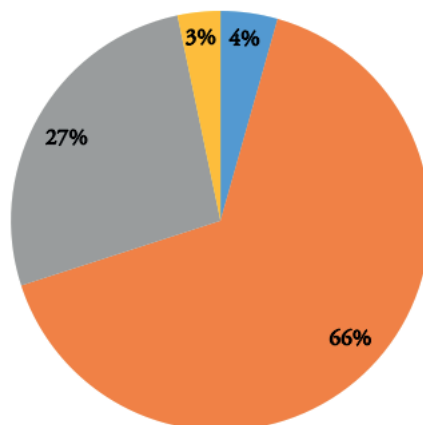
Figure 1. Percentage of the students' attitude toward ICT

The diagram above found that 66% of students have a positive attitude in using ICT for English learning, and 27% of the students have a moderate attitude. Meanwhile, 4% of students have extremely positive attitudes, and the rest, 3%, are negative attitudes toward ICT in learning English.

Teachers' Competencies

The theme that emerged from the interview findings can be classified into five competencies: competencies in accessing ICT, managing ICT, evaluating ICT, creating ICT products, competencies of using the ICT.

Competencies in accessing of ICT

Knowing Typical ICT

In general, all the three teachers' responses indicated that they know about typical of ICT, as one of them reported:

> I do know some of them like computer, laptop, Internet, LCD projector, software in computer and others. Then the function what I know is crucial like projector I like to use it to deliver material, watch education video in English so it really helps me (T2).

The statement shows that T2 has known about typical ICT media and tools that are often used in the classroom to teach then knowing about its general function as a media or facilitator in conveying the English to the students. Further, others gave the following response:

> Yes, I do know such as laptop, projector, Internet and so on. It helps us as a teacher to deliver our material. Like PowerPoint and internet especially when we couldn't find it in the textbook (T1).

From this excerpt, T1 mentioned some of the typical ICT's commonly used in the teaching-learning process. The teachers continued by mentioning ICT usage, such as the Internet, helping the teacher find the additional material he wanted to teach in the classroom.

It could be said all English teachers knew the ICT literacy component of accessing the part of *"knowing about"*. The ultimate usage of the ICT described by all teachers is to ease the teacher in delivering English material.

Knowing How

Whether the teachers know how to use the typical ICT, they had different answers such as T1 responded, *"Sure, I used PowerPoint, video, audio speaker and internet in the class to teach"* (T1). He used various ICT's media and tools in teaching English showing that he has competencies in using and operating these devices. T2 described how she used the media in the class in the following response *"Yes, I do use ICT in teaching such as PowerPoint, then I also shared a video with my students they can learn some are speaking through video"* (T2). She used PowerPoint and video to help her students providing additional information and improving students' English skills. This showed that T1 and T2 have been known about accessing components in the *"knowing about"* of using ICT media and tools. This is in line with the standard ICT competency that teachers should be able to support their instruction by using presentation software and digital resources. However, T3 was slightly less competent in *"knowing about"* using ICT, as he reported:

> I am not too familiar with ICT, so sometimes you can say that I am "gaptek" (lack of technical ability)" I never use the projector in the class. I can study about it, but I don't know I feel reluctant to do it, but yes I do sometimes use audio in the class but just the basic (T3).

T3 was unfamiliar with most ICT media and tools, however, she could learn more about how to use these media. She felt less confidence in using ICT causing her to hardly use the ICT in the classroom.

Based on the descriptions above, it could be concluded the teachers had known various kinds of ICT media or tools and the function for optimizing the English class; therefore, they used ICT as their media aid in teaching English.

Competencies in Managing ICT- Retrieve Information from the Internet for Teaching

ICT management deals with applying an existing organizational or classification scheme for information. This could be seen in the statements of how the teachers get information from ICT's media and tools:

> I got from internet, there are many sources, and I took it as my material to teach like pictures, video or songs in English for sure (T1).

He conducted the fragmented of accessed information through cyber media. Further, he applied to his students in the form of usable and structural information which was similar to what the T2 did:

> Usually, I use internet to find certain material, I browse from many kind websites or even a blog, after that I used to make a PowerPoint from it (T2).

Therefore, both teachers managed the information from the ICT for retrieval to the next presentation by themselves. However, this did not happen to Teacher 3 (T3), as she responded:

> Yeah, from Internet, sometimes I found it by myself or sometimes I asked my students to find the related material from internet and then present it in front of the class (T3).

She could not fully manage the accessed information by herself and sometime delegated the students to manage by themselves.

Competencies in Integrating ICT

Evaluating ICT literacy deals with making judgments about the quality, relevance, usefulness or efficiency of information. T1 and T2 responses were comparable as they reported:

> *I believe the ICT does improve students' achievement, like when any material that not included in the book, they can find it through internet, and it is influencing their score to be better (T1).*

The internet and PowerPoint became the main sources for T1 in collecting and retrieved his material. He interpreted and represented information from multiple media sources through summarizing and collecting then gathered in the information into his own presentation. Similar to T1, T2 also used Internet and PowerPoint in representing and integrating the information from various sources into important points in presentation software. In contrast for T3, she had her own way in integrating the information into English class:

> *Because I am not using LCD projector into teaching, so I just rewrite the information to the whiteboard and along with the explanation. I don't want to bother myself to make a slide or others because I couldn't use LCD projector and not competence in making presentation by PowerPoint (T3).*

T3 conveyed the information that she got from Internet to the students. She did not want to distress herself with all the activities that involving projector and PowerPoint. Therefore, the teachers used ICT media especially Internet and PowerPoint to integrate the information by interpreting and representing the information that they found from multiple sources and delivered it to the students in the process of teaching learning English.

Competencies in Evaluating ICT

Evaluating ICT literacy deals with making judgments about the quality, relevance, usefulness or efficiency of information. T1 and T2 responded were comparable as they reported:

> *I believe the ICT does improve students' achievement, like when any material that not included in the book, they can find it through internet, and it is influencing their score to be better (T1).*

From this extract, T1 assumes that ICT improves students' achievement through their exploration by Internet about English materials that are not available in the book. T2 also gave the same positive answer about the influences of ICT on students' achievement in the following response:

> *Yes, I think so, I think it would be more given them explanation such as not only gave them long explanation but also could give them some examples through ICT that we used (T2).*

T2 presumed students could get detailed information from ICT, improving their English achievement because they got a more straightforward explanation. The other judgment is from T3 that uttered the usefulness of ICT in boosting up students' mood that improves their English performances; T3 applied music to make the students felt refresh while studying English, as the following response indicates:

> *Yes sure. Yap. That brings many influences to the students. They are more interested than only study as usual for example listening to music. I do a missing lyric when the students bored then they will be listening to music, and it makes them refresh. And I also believe that study by using ICT will improve their ability (T3).*

Relevance of ICT to Teaching English

The teachers were also asked about the relevance of ICT toward their English teaching, as one of them responded:

> *The process of my teaching became easier by the help of the ICT tools and media. For example, the material that I found the clearer explanation of the material about English that I couldn't find in the book. The students seemed to be more relaxing and paying attention to us when we use such as projector or played the video in front of the class. So… it really helps me (T1).*

According to the above response, T1 admitted that ICT had simplified his job as a teacher. The teacher could find any information on the Internet; here, the teacher utilized ICT to browse the material by only typing the keyword and then finding the answers. Similar to T1, T2 gave the following response about how ICT helps her teaching as she reported:

> *ICT helps me in preparing material to teach. So…I am not only using material from the book, but I get additional material to enrich my explanation by browsing it through Internet (T2).*

These responses indicated that ICT helps the teachers provide more comprehensive information needed to teach, so a more precise explanation would be given to the students about the material that could not be found in the textbook. Meanwhile, the response from T3 regarding her teaching using ICT was slightly different:

> *Although I am not often using ICT in my class, I can say, if we optimize the usefulness of ICT into our class, the process of teaching will be more effective and efficient (T3).*

According to the above extract, T3 admitted that she did not commonly use ICT in the classroom; however, she believed the efficiency of the ICT into the teaching process of English would make them more effective outcome from teaching-learning in the part of the improvement to the students' achievement.

Following the statements above, the teachers were able to judge and evaluate ICT usage and efficiency to improve students' achievement and their teaching performance for English. They knew and believed that using ICT media and tools in teaching and learning English was beneficial for both teachers and students.

Competencies in Creating ICT Product

Creating an ICT product is generating information by adapting, applying, designing, inventing, or authoring information. Teachers used social media and made a video for their teaching as T1 informed as follows:

> *Yes, yes, I have social media. I don't have a blog yet but I am planning to and I have video that I made with students and I always show it as an example when I teach the material about drama (T1).*

T1 created and designed a video to describe an event and support his teaching material. T2 and T3 mentioned that they had only social media and used it for sharing material to the students, in the following excerpt:

> *Actually, I don't have any blog, but I usually share my material with my students by using Line because most of my students is using Line, not only material but also assessments. It really helps me especially when I was not attending the class (T2).*

Although T2 only had social media as her ICT product, she made her social media a medium for her and her students to communicate and interact regarding the English problem. In addition, T3 only had social media of Facebook; the following is the response of T3 about ICT product:

> *Yes, I have only social media like Facebook but no other media. I have one FB group that used to my English students in other schools to discuss our meeting and other about English also it is a place for them to ask and answer new vocabulary, idioms, new terms or phrases (T3).*

From this response, T3 maximized the group from Facebook to discuss and consult the students' problems about English.

Furthermore, the observation results have revealed that teacher 1 (T1) did and have all 15 aspects from five components of ICT literacy. All aspects could be seen during the class when the T1 used a Media player, laptop, and audio to present the students' practice assessment. T1 maximized the provided ICT in the school to teach his material, and T1 seemed confident in using and presenting ICT media and tools. Meanwhile, teacher 2 (T2) showed 12 aspects of four components during the class. T2 used a laptop and mobile phone to teach speaking. She used the ICT but did not fully integrate and adopt the material from ICT media and tools into her teaching. Then, teacher 3 (T3) used limited ICT facilities in her teaching. She used a textbook, worksheet copier, whiteboard, and marker. Also, she evaluated the students' assessments manually. Therefore, it could be said that T1 was more competent rather than T2 and T3 in using ICT's media and tools in teaching and learning English. These findings supported the data from the interviews.

DISCUSSIONS AND CONCLUSION

To begin with, the researchers present the students' attitudes gathered from the questionnaires followed by the description of the teacher competencies toward ICT in teaching English. The findings have showed that the 11th graders had a positive attitude toward ICT while learning English in the classroom. It was found that 70 % of the students have a positive attitude in using ICT for English learning, as 66% have a positive and 4% have an extremely positive attitude. They could learn new things, were more confident, help them to complete their projects or assignments in English. The findings were relevant to support previous research which concluded that ICT was beneficial for learning (Gubbels et al., 2020; Kjellsdotter, 2020; Reyna et al., 2018; Sundqvist et al., 2021). The students also indicated that they were relatively confident in using ICT although they still required friend's assistance nearby. This relatively links to Magen-Nagar and Shonfeld study (2018) that although students were unfamiliar with the technology, technological anxiety could be lessened with collaborative learning.

Through the interview and observation findings, it was found that the competency of English teachers was various. T1 had good competence by considering several aspects as he T1 knew the type of ICT and its function. He used the provided ICT in teaching and assessing the students, created, and used the products from ICT. He also evaluated the influence of ICT on students' achievement in English and had very good ability in operating ICT media and tools (Asik et al., 2020). He believed that by using ICT it could improve students' achievement in English. Having adequate provided ICT media and tools in the school was beneficial for teachers in applying their material to optimize the delivery of subjects (Agyei, 2021). They are more likely to incorporate ICT use in their classroom if they see it is relevant to their instruction and are convinced that the design of educational software is compatible with educational goals and the individual learning needs of students (Williams & Kingsley, 2004). This support previous research by Chisango (2019) that the teachers had a positive perception of the used of ICTin their teaching and learning and those who knew the benefits of using ICT were the ones who were ready to adopt technology in education.

T2 has average competence as she knew typical of ICT and its function. She used the provided ICT in teaching and assessing the students, created the ICT products but not mainly for educational purposes. She was able to evaluate the influence of ICT on students' achievement in English and knew an average ability in operating ICT media and tools. She was able to operate almost all the ICT media and tools. She was confident using ICT for her teaching in front of the class (Chisango et al., 2020). The students looked positive and excited if the teacher used ICT in teaching English (Gubbels et al., 2020). A better understanding of motivational aspects of using ICT from the teacher can make it more effective and increase the potential for ICT to be more widely used in language teaching and learning worldwide (Hafifah & Sulistyo, 2020; Patil, 2014).

Next, T3 has shown that she had a poor level of ICT competence. She lacked of confidence to use ICT in teaching English while the school provided ICT media and tools that could be freely used to support the teaching-learning process. The four English skills could be effectively taught to students using ICT media and tools. Although she knew about the types and essential functions of ICT, she did not apply it in the class. Related to media and tools, she did not have competency almost for all the items. This might occur due to complicated usage of ICT, which the teachers have difficulties to master, and are less motivation and confidence to understand more about how to use ICT (Chen et al., 2019; Zanzali & Kassim, 2010). This is relevant to Lawrence and Usman investigation (2018) of factors that influence teachers use of ICT in their teaching at teacher-level factor such as age, gender, educational experiences, knowledge of ICT, and attitude toward ICT. It is assumed that T3 might have a negative attitude toward ICT; meanwhile, teachers' attitude toward the use of ICT for educational purposes is one of the crucial factors for the success of the ICT utilization in schools (Al-Zaidiyeen et al., 2010). Literature on teachers' ICT competencies has indicated that foreign languages teachers have above basic, intermediate or poor knowledge of ICT applications in the teaching-learning process (Malinina, 2015; Rahimi & Yadollahi, 2011).

The findings have indicated that teachers' competencies toward ICT were varied and regarded as good, average and poor competency. This implies that teachers are required to master a number of new ICT devices and programs for the education environment. Maximizing the use of technology allows the teaching and learning process become more enjoyable for the students. Thus, providing teachers with professional development program related to ICT would be beneficial for both the teachers and their students.

The case qualitative study design with small sample of three secondary English teachers is not representative of all the secondary teachers in Indonesia, therefore generalization of the findings cannot be made. However, the results of this empirical study are very significant in understanding the teachers' ICT competencies to teaching. Future research might investigate similar interest with more numbers of participants to enrich our understanding of teachers' ICT competencies.

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THE EFFECTS OF USING FLIPPED CLOUD LEARNING WITH ADVANCING MATHEMATICAL THINKING APPROACHES ON UNDERGRADUATE STUDENTS' MATHEMATICAL CRITICAL THINKING

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ABSTRACT

The flipped learning approach of instruction sees classroom lectures moved outside of classrooms through devices and technology. Homework is moved inside classrooms as learning activities. Due to the COVID-19 outbreak, cloud-based education platforms - the organization of the educational environment in the cloud as a tool to enable teaching and learning - have been widely deployed to support online instruction. In this study, flipped cloud learning, incorporating approach of advancing mathematical thinking, were conducted in Mathematical Analysis course to study students' mathematical critical thinking. A quantitative method, using a pre-test-post-test design, was employed with a group of 56 undergraduate mathematics students. The research instrument was a mathematical critical thinking ability test. The quantitative data were analyzed using the descriptive analysis, n-gain and t-test. The findings revealed that students had statistically significant mathematical critical thinking of higher than 60% of the full score at the .05 level. There was an increase in students' mathematical critical thinking abilities with a mean n-gain of .64, which was moderate. The findings also show that the students' mathematical critical thinking was significantly enhanced by this approach at .05 level. Thus, it could be summarized that integrating strategy for advancing mathematical thinking into flipped cloud learning positively affected students' mathematical critical thinking. The results also suggest that this reformed learning approach might be usefully employed as an instruction model in the new normal context.

Keywords: Cloud technology, flipped cloud learning, mathematical critical thinking, undergraduate students.

INTRODUCTION

Mathematics is a subject that involves reasoning, problem solving and thinking processes which is important for human development (Yang, 2017). Mathematics is usually used as a tool to express people's thoughts via the use of critical and systematic thinking (National Council of Teachers of Mathematics, 2011; Office of the Education Council, 2017). The nature of mathematics teaching is abstract with a focus on content. Traditional learning approaches often fail to create an appropriate learning environment and can cause students to misunderstand the content (Noor et al., 2020). According to Angraini and Wahyuni (2021), mathematical learning processes work well where teachers provide students with opportunities to practice their thinking processes while learning new content. Similarity, Ramananda and Srinivasan (2019) suggest that instructional approaches in teaching mathematics should encourage students to learn by thinking and

problem solving on their own. In the twenty-first century, mathematics in higher education should not only focus on basic mathematical knowledge and skills, but also on developing mathematics graduates' ability to express facts, solve problems and contribute to reasoning and advanced thinking (Alabdulaziz, 2022; Angraini et al., 2019). This accords with Kong (2015), who states that improving mathematics teaching methods will allow students to think and solve problems on their own by learning and exploring various media and technologies.

Mathematical critical thinking is considered to be higher order thinking; in other words, it goes beyond memorizing (Kraisuth & Panjakajornsak, 2017; Suardana et al., 2018). A critical thinker can distinguish relevant and unrelated information from mathematical problems (Silviariza et al., 2021). According to Wahyuni et al. (2019), critical thinking is essential for students to be able to find solutions to problems. Aizikovitsh-udi and Cheng (2015) suggest that critical thinking in learning supports learning regulation and the skills of students. Critical thinking in mathematics learning involves cognitive processes based on mathematical reasoning to obtain mathematical knowledge (Husnaeni, 2016). Students' thinking, to explore, examine, use questions, make connections and evaluate all aspects of information related to mathematical problems, are requirements of mathematics learning processes. In some sense, it requires students to perform critical thinking (Angraini & Wahyuni, 2021).

The interesting strategy of organizing learning activities for advancing mathematical thinking proposed by Fraivillig (2001) focuses on students' thinking processes. The approach consists of three components: (1) Eliciting. This is an important step for the development of the mathematical thinking of students, which challenges students' mathematical thinking; for this phase, students are encouraged to express their thinking through speaking or writing; (2) Supporting. Students' thinking and mathematical understanding is promoted in this phase; and (3) Extending. A learning process that expands students' mathematical concepts by comparing solutions in different ways, extending to new problems.

Dynamic changes in the world and the advancement of digital technology have affected human learning (Shyshkina et al., 2017). The educational paradigm has shifted from a teacher-centered mode to a student-centered mode (Liu & Yan, 2021). Many educational institutions use information technology systems as part of their organization management, including in classrooms (Elena et al., 2019; Iji et al., 2017). The development of academic contexts with the use of more information technology corresponds to the behavior of most current students, who engage with the internet and social media (Techasukthavorn, 2019). Today's students have different learning expectations; their dispositions differ from previous students (Cevikbas & Argun, 2017). In the twenty-first century, students want to be free agents; preferring to enjoy quick access to a variety of learning resources via digital technology channels to implement their own knowledge (Cevikbas & Kaiser, 2020; Engelbrecht et al., 2020). Therefore, instructors need to be involved in organizing content and activities using various media and digital technologies (Lai & Hwang, 2016). As a result, the use of technology as part of teaching and learning activities, to share knowledge and experiences with students, has gained more attention from and is desired by mathematics teachers (Goos et al., 2020; Hooks, 2015; Sen, 2022).

Cloud technology is a network-based resource sharing service that allows users to share resources as required and allows them to access resources and other applications, programs and services over a computer network (Yang, 2017). The storage space for the resources that users need is provided in the cloud. Users can access the data in the cloud from anywhere (Militsopoulos et al., 2016; Yimer, 2020). This ease of access means that anyone can search for knowledge using technology tools and store it on various mobile devices (Tiejun, 2019). The cloud technology has outstanding properties and features that facilitates connections between various data and prevents the loss of learning materials and information from teacher-student interactions (Cen & Cai, 2017; Etcuban & Pantinople, 2018). The extension of cloud technology into education has been developed in the form of teaching and learning interactive activities between teachers and students (Gonzalez-Martinez et al., 2015; Semenikhina et al., 2019). The organization of learning using cloud technology helps students to develop skills in learning performance (Kasiolas, 2017; Kraipiyaset et al., 2019). Furthermore, the exploration and self-learning of mathematical knowledge online in the cloud is likely to make learning more fun, which is a contributing factor to the increase in cloud mathematics learning (Jin & Ding, 2017; Ramananda & Srinivasan, 2019).

Flipped learning is one of the transformational approaches that has changed the digital reorganization of mathematics teaching, and contributed to the integration of technology into mathematics education and for engaging students in mathematics contexts (Cevikbas & Kaiser, 2020; He, 2020). It is an approach that has changed many elements of instruction, including pedagogical concepts, instructional purposes and more flexible teaching time; it is a mode of instruction that uses supported technologies (Jian, 2020; Kaya, 2021). The flipped model has also been identified as an approach that maximizes face-to-face sessions through lectures and has contributed to hands-on activities (DeLozier & Rhodes, 2017) in such a way that instructors teach students (including students exploring their own knowledge or learning by themselves) outside the classroom, and then the students do their homework or their tasks by themselves in class (He, 2020). The flipped learning approach requires students to have a high degree of responsibility for their learning outside the classroom and there must be sufficient technology and internet equipment for such teaching and learning to take place (Chen & Wen, 2019). A flipped approach is therefore likely to be more suitable for teaching at the higher education level and is one of the educational innovations that has been studied for enhancing learning experiences and competences (Kostaris et al., 2017; Sen, 2022).

Generally, regular classes are restricted to face-to-face interactions in classrooms. However, during the COVID-19 pandemic, many classroom sessions were replaced with online classes (Alabdulaziz, 2022). For young modern students familiar with personal learning using social technology, online mathematics teaching has been widely applied in educational institutions (Elena et al., 2019). Recently, the idea of online learning has been increasingly used and applied as a means of enhancing mathematics learning for students (Anyor & Abah, 2014; Sen, 2022; Techasukthavorn, 2019). The process of online mathematics learning is allowing students to practice their divergent thinking processes, express their own opinions and self-assess according to their abilities (Huang & Su, 2016). A well-designed flipped mathematics class can improve students' mathematical thinking and understanding (Cevikbas & Kaiser, 2020).

Although the flipped model is recognized as an effective teaching method, it does not mean there is only one type (Lencastre et al., 2020). For mathematics education, the integration of flipped learning with other techniques creates more active learning and enhances the purpose of mathematical performance, such as critical thinking (Joubert et al., 2020). Most research into flipped learning has primarily addressed the efficacy of using such an approach on student outcomes; it has not focused on classroom activities that develop mathematical thinking. Suardana et al. (2018) found that the teacher's teaching methods affected students' critical thinking, especially where the teachers used educational technological innovations in their learning activities and provided opportunities for learners to study and explore using various media and technologies (Yimer, 2020). In such contexts, students had higher critical thinking skills than those who were taught and studied using traditional methods. This follows Weinhandl et al. (2021), who suggest that using technology as a tool to learn mathematical algorithms, computation and problem solving to get a final solution, makes mathematics learning more interesting and improves students learning outcomes. Based on the theoretical background and the previously identified problem, online mathematics learning using a flipped cloud learning based approach to advancing mathematical thinking is deployed as the instructional pedagogy in this study. How learning, based on such an instructional model, influences mathematical critical thinking ability is also considered.

The purposes of this study were to examine the mathematical critical thinking abilities of students after they have undertaken flipped cloud learning incorporating advancing mathematical thinking compared to the 60% criteria, and to measure their mathematical critical thinking abilities both before and after implementing the proposed instructional pedagogy.

LITERATURE REVIEW

Flipped Learning

There are various names for flipped learning, such as; the inverted classroom (Lage et al., 2000), classroom flip (Baker, 2000), flipped classroom (Bergmann & Sams, 2012) and flipped learning (Ouda & Ahmed, 2016). The flipped learning approach focuses on student centered learning which uses the time previously spent on lectures (in class) for practical activities or assignments (Cevikbas & Kaiser, 2020; Kostaris et al.,

2017). The conventional events that used to take place in the classroom are shifted outside the classroom and vice versa (Voigt et al., 2020). It is one of the teaching reforms that uses supported technology to contribute to students' learning (He, 2020). There are two aspects of this approach which may be referred to as 'do the studying at home' and 'do the homework in school'. These are the two learning phases that distinguish it from other learning approaches (Khasanah & Anggoro, 2022). The lectures for basic knowledge and lesson content are available to do at home (out-of-class) using information technology tools for students to learn by themselves at home (Bergmann & Sams, 2012). It is one of the most innovative pedagogies that has led to the creation of active instruction environments, and has the potential to develop problem solving, thinking, communication and social interaction skills (Cevikbas & Argun 2017; Nayci, 2021). Flipped learning is an approach that provides an environment for students to actively construct their own knowledge (Cevikbas & Kaiser, 2020). Therefore, it is consistent with social constructivist theory (Ouda & Ahmed, 2016).

Flipped learning has been researched in a wide range of fields and at various levels of study (Sen, 2022) such as science, technology, engineering and mathematics (STEM) and information communication technology (ICT) (Jdaitawi, 2019; Kostaris et al., 2017), pronunciation instruction and speaking skills (Khasanah & Anggoro, 2022; Pratiwi et al., 2022) and English writing (Altas & Mede, 2021). The flipped learning model has been used in research studies to improve students' academic learning outcomes (Kong, 2014; Love et al., 2014; Rahman et al., 2014; Saenboonsong, 2017; Sen, 2022). Bangpoophamorn and Wiriyanon (2019) deployed a flipped classroom with self-directed learning for undergraduate students, which enabled them to become higher critical thinkers. Studies have also been conducted to investigate the potential of the flipped model in mathematics classes. Lai and Hwang (2016) employed a self-regulated flipped classroom approach on a mathematics course and found that students achieved more. Bergmann and Sams (2012) note that the flipped pedagogy adapts mathematics classrooms and turns them into laboratories for mathematical inquiry and critical thinking. It is supposed that high school students can increase their performance in mathematics (Atwa et al., 2022; Bhagat et al., 2016; Wei et al., 2020), learning engagement (Kaya, 2021) and communication (Boubih et al., 2020) by studying based on the flipped model compared to learning traditionally. It has also been found that mathematics teaching and learning processes in high schools have been developed using a flipped classroom integrated with STEAM Education (Sutama et al., 2020). However, existing flipped model studies have solely addressed flipped mathematics classes in cloud environments in higher education. In this study, the analysis is based on flipped cloud learning for mathematics students at undergraduate level.

Cloud Learning in Mathematics

Cloud technology is a system in which the data processing and data storage are performed outside the mobile devices themselves (Sultana, 2020). As the computation and storage of data is done in the cloud, this allows applications to be distributed more widely to mobile users and not only to complex users (Xiong et al., 2019). Cloud technology services employed for mathematics learning consist of the three following models (Shyshkina et al., 2017): (1) Infrastructure as a Service (IaaS), which provides the development of infrastructure services, including processors, memory, storage system and networking. These resources are located on virtual systems that can be accessed via the internet; (2) Platform as a Service (PaaS), which is a system service for supporting application development, testing and the development of application management services; and (3) Software as a Service (SaaS), which is the provision of software or applications that are made available by processing to the service provider. Users can use it via the internet without installing the programs on the devices. The characteristics of the services of cloud technology have been developed to divide the resource infrastructure stored in phones, computers and other electronic devices (Chen & Huang, 2017). The educational cloud services include all websites in the cloud technology that can be used as tools to support and promote mathematics teaching and learning activities (Iji et al., 2017). In addition, there is ready access to the cloud service (Rimale et al., 2017). The cloud technology service allows various terminals to access it via a web browser. The cloud also serves as a mathematical learning website that provides software for teachers, students and anyone interested in using the programs for free without installing them on their computers (Saenboonsong, 2017). As cloud-based services have developed for educational applications, the tools now support learning in higher education mathematics (Iji et al., 2017). Online educational tools for mathematics promote students' rational and problem-solving thinking skills

(Ramananda & Srinivasan, 2019); the flipped approach uses technology and improvements in mathematics teaching to achieve these goals (Cevikbas & Kaiser, 2020). It is important for teachers to consider using technology strategically to enhance accessibility for all students (Attard et al., 2020; National Council of Teachers of Mathematics, 2011). For example, the features of cloud-based applications are suggested to enhance mathematics instruction for graduate students (Denton, 2012). Inquiry learning was used as the theoretical foundation via cloud technology in the study of Kanjug (2015) to enhance critical thinking and collaborative learning. Alternatively, Sukonwiriyakul (2017) employed mobile learning in the cloud with a 4E×2 model to develop the mathematical problem-solving abilities of seventh grade students. A study into technology enhanced mathematics teaching in secondary education (Weinhandl et al., 2021), suggests that it facilitates comprehension and exploration from various perspectives and assists performance in calculations making them quicker and more reliable. Furthermore, the study of Wahyuni et al. (2019) which deployed a pre-test post-test of edmodo-based blended learning with a group of students, found that their scientific critical thinking skills were enhanced.

The Teaching of Mathematics During the COVID-19 Pandemic

Distance Learning Mathematics

During the COVID-19 outbreak students and instructors were quarantined. For this period adjustments were made to instructional methods moving learning from on-site to online learning or digital learning (Giatman et al., 2020). This affected mathematics education and classes were primarily held using remote teaching during the pandemic (Lavidas et al., 2022).

Distance learning, also known as distance education, e-learning, and online learning became an important tool for teaching and learning during this period (Al-Naabi et al., 2022). In distance learning, there is a physical separation between instructors and students, and educational technologies are used to support communication between them (Karahisar & Unluer, 2022). This can be employed in both synchronous or asynchronous modes (Purbudak, Yilmaz, & Cakir, 2022). The learning process was carried out to meet the requirements of students using both synchronous and asynchronous blended teaching by various teachers at all levels of education (Lavidas et al., 2022). One positive outcome of the response to the COVID-19 pandemic has been the incorporation of digital technology and digital learning platforms and their infrastructures into the distance learning process (Lavidas et al., 2022; Mulenga & Marban, 2020).

The COVID-19 pandemic has changed the instruction process (Mulenga & Marban 2020). Alabdulaziz (2021) found that 98% of mathematics teachers said that the pandemic was a gateway for digital mathematics learning, and that even after the outbreak the use of online mathematics education has expanded. This explains why several types of online education tools for promoting online learning are now used. Alabdulaziz (2021) has elaborated on the digital technology frequently employed by teachers for facilitating teacher-student communication in mathematics learning during the pandemic, including mobile technologies, touchscreens and pen tablets. Other mathematical tools used for online teaching were the Massive Open Online Courses (MOOCs) and computer algebra systems (CAS). In terms of content communication, Zoom, Google Meet, email, and other communication facilitators were utilized (Goncalves et al., 2020). Riyanti and Nurhasana (2021), noted that those students who used Google Classroom during the pandemic for classroom interactions based on blended learning, have better logical thinking abilities. Additionally, the study by Lavidas et al. (2022) reveals that digital environments that have had an essential role for exchanging and communicating materials for mathematics distance learning include: WebEx, Zoom, e-class, Photodentro, Wordwall, Quiziiz, Google docs, Learning apps.

Distance learning has brought about a change in teaching techniques. Students can now have a range of learning experiences including, a discourse session, video lesson, lesson materials, group work, group discussion and presentation as well as other learning modes (Doz et al., 2022). For evaluation, several methods can be used, such as online tests, online work and presentations (Doz et al., 2022; Wahyuni et al. (2019). Regarding the usefulness of online learning, some studies found that students said it was more flexible in terms of time and location (Goncalves et al., 2020) and that it improved academic performance (Goncalves et al., 2020; Gonzalez et al., 2020), although it was possible to cheat during online exams (Nguyen et al., 2020). Doz et al. (2022) found that although students said they preferred in-class teaching, the grades

they obtained during remote mathematics teaching in the quarantine period increased, compared to their pre-epidemic grades. It is important to recognize the gains made when using technology for mathematics education (Radhy, 2019). This finding is consistent with those of Heyd-Metzuyanim et al. (2021) who found that educational success in mathematics was positively correlated with their success in mathematical media literacy tasks. Similarity, Riyanti and Nurhasana (2021) suggest that the ability to apply technology, as was done during the COVID-19 pandemic, is desirable as it enables students' critical thinking competencies. Therefore, despite school and university closures during the pandemic, it can be seen that online learning in mathematics education has had a positive outcome (Alabdulaziz, 2021).

Flipped Cloud Learning

A cloud technology platform can be used to support distance learning and can also be adapted to the flipp learning model (Cen & Cai, 2017; Saenboonsong, 2017). From the pedagogical literature previously mentioned, there is limited scientific research regarding specialized cloud-based services that contribute to the development of thinking skills in mathematics undergraduate students. Flipped cloud learning as distance learning was deployed during this period. The flipped cloud learning for advancing mathematical thinking approach comprises principles that are supported in the model, namely, eliciting, supporting and extending, as is embedded in this research study.

The overview of this strategy framework is shown in Figure 1.
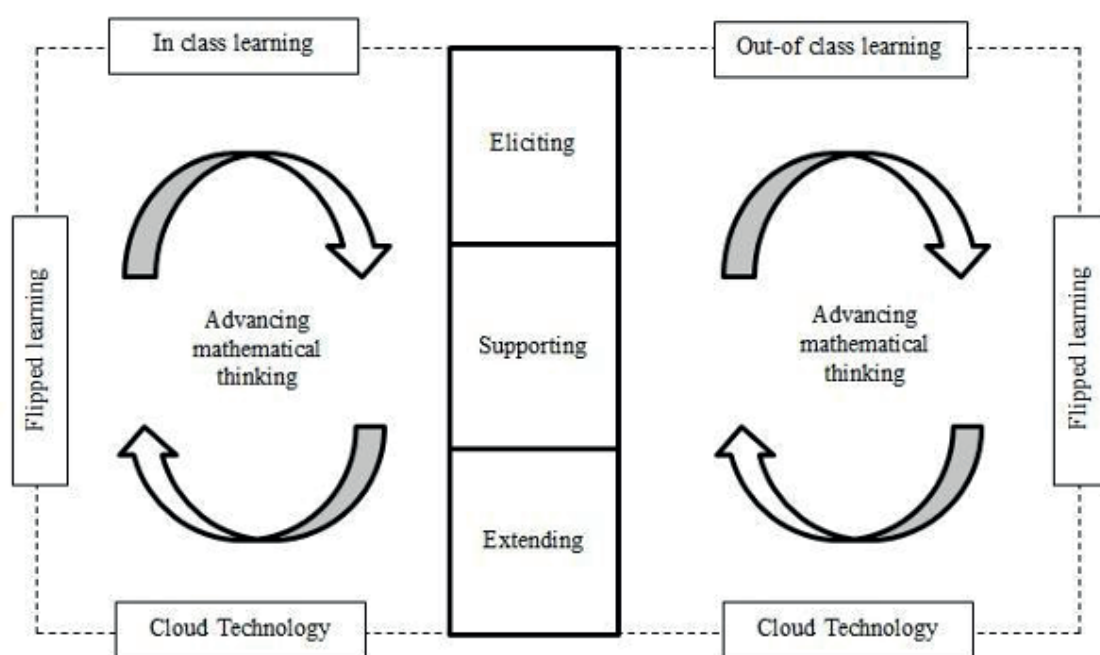
Figure 1. The architecture of flipped cloud learning for mathematics with advancing mathematical thinking in this study

Mathematical Critical Thinking

Mathematical thinking is the cognitive process of facing mathematical and reasoning problems to acquire knowledge and learn how to resolve them (Goos et al., 2020; Husnaeni, 2016). The important mathematics thinking skills are critical thinking, creative thinking, and problem solving (Suryati et al., 2019). Critical thinking is the ability to practice personal responsibility and self-control, obtained from observation, experience and prior knowledge to consider relevant problem information (Supriyatno et al., 2020). According to Ennis (2011), critical thinkers have basic classification skills, analytical ability, are able to make inferences, can clarify, make predictions and have integration skills. Various thinking skills are related to

critical thinking, such as the ability to determine the identification and credibility of information sources and observations, the consideration of consistency with prior knowledge and the ability to draw conclusions with principles and reasons (Jatmiko et al., 2018). A definition of critical thinking is rational reflection and thinking that allows for the formation of reasonable judgments.

Other indicators of critical thinking from researchers include that of Cottrell (2011), who describes the ability to think critically as being able to interpret, analyze and to develop a conceptual understanding and argument. Wang and Zheng (2016), say that critical thinking involves the ability to interpret, evaluate, observe, communicate, and acquire information. Wahyuni et al. (2019) mention five indicators for scientific critical thinking skills, as follows: fact analysis, submission of reason, conclusion, submission of arguments and presentation of implications. Critical thinking in mathematics as suggested by Angraini and Wahyuni (2021), has three indicators, the ability to identify relevance, the ability to determine problems into a mathematical model, and the ability to draw conclusions based on inference principles.

Therefore, it can be concluded that critical thinking is the careful consideration of a situation and/or problems that arise by gathering reliable information or evidence to support it or not, before deciding what action to take. Students will be able to learn mathematics critically when they use these indicators of critical thinking (Facione, 2020; Supratman et al., 2021). Table 1 illustrates the indicators and operational definitions of mathematical critical thinking that have been considered in this study.

Table 1. Indicators and operational definitions of mathematical critical thinking abilities

No.	Indicators of mathematical critical thinking abilities	Operational definitions
1	Fact analysis	Ability to identify questions, analyze key components and definitions of facts shown in the problem.
2	Selection of relevant information	Ability to select or write pertinent information such as the definition, concept, and theory to describe the given situation to be used to solve the problem.
3	Mathematical formulation	Ability to identify, interpret important information and evaluate assumptions into mathematical models. In other words, it is the ability to make assumptions in accordance with the mathematical problem.
4	Reasonable conclusions and references	Ability to accept the conclusion by using mathematical definitions, rules, principles, and theories for making valuable judgments including reliable presentation, explanation of implication and reference. References for problem solving and making reasonable.

Source: Angraini & Wahyuni, 2021; Ennis, 2011; Wahyuni et al., 2019.

From the study of the related research into critical thinking, it was found that most research studies have led to improvements in critical thinking ability by using teaching approaches that organize learning activities or by using training programs that the researcher has synthesized or developed. Some studies have been conducted regarding the implementation of flipped classrooms (Asmara et al., 2019; Bangpoophamorn & Wiriyanon, 2019). Encouraging students' thinking skills by employing learning strategies is associated with the practice of critical thinking. It is also expected to enhance higher mathematical critical thinking. In this regard, the relationship between advancing children's thinking approaches (Fraivillig, 2001) and indicators of mathematical critical thinking are analyzed in Table 2.

Table 2. The analysis of the relevance of advancing children's thinking approaches and mathematical critical thinking abilities in this study

No.	Component	Strategy	Mathematical critical thinking abilities
1	Eliciting	The advanced problems based on the lessons are used as tool for students to express their thoughts. To achieve this step, the instructor must put emphasis on taking multiple answers from students for one problem.	Identification of questions/problems, analysis of the key components and definitions of facts shown in the problem.
2	Supporting	The instructor support students' mathematical thinking.	The ability to explain their friends' methods of solving problems in their own words while retaining the same meaning.
3	Extending	Providing analysis, comparing solutions in various ways by adjusting problems or changing new ones while also expanding students' thinking by encouraging reflection of mathematical ideas and finding other methods and summarizing mathematical concepts.	The ability to comment, analyze, compare and summarize the mathematical lesson and problem formulations.

METHOD

Research Design

This study is pre-experimental research, involving one group, using a pre-test-post-test design (Edmonds & Kennedy, 2017). It has been carried out to determine any changes related to the treatment's effect on the subjects, to identify any impact on mathematical critical thinking. It has been conducted without a comparison class because of the scheduled timetable provide by the university.

Participants

56 undergraduate mathematics students in their fourth year of university, enrolled on a Mathematical Analysis Course in The Faculty of Education located in Thailand, were involved in this study. The participants were selected using a purposive sampling technique. The study was conducted in the second semester of the 2021 academic year. The students were all aged between 21-22 years.

The information about the gender of the participants in this study is shown in Table 3.

Table 3. Demographic data

Gender	N	Percent
Male	12	21.42
Female	44	78.57
Total	56	100.00

Table 3 shows the frequency distribution and percentage of subjects as classified by gender. There was a total of 56 subjects, of which 44 were female (78.57%), and 12 male (21.42%).

Procedure and Implementation

Procedure

The research procedure was initiated in the study on the related theoretical background and framework, and the development of the instructional approach, with reference to the strategy of advancing children's mathematical thinking (eliciting, supporting and extending) of Fraivillig (2001) using the flipped model.

G Suite in Google Classroom was deployed to develop the cloud learning tools. Class preparation included the following: (a) the development of mathematics material in the form of videos and lessons. Assignments were given to the students for their out-of-class based study prior to their face-to-face session; (b) the design of the learning based on the cloud environment. The Google Meet cloud platform was employed for the mathematics online class session. Prior to the face-to-face online classes, the students were principally exploring the mathematics materials (video tutorials, lesson content) and self-assignments displayed in Google Classroom.

Implementation

The Mathematical Analysis Course was used to conduct the experimental research. The study was carried out during one semester which consisted of four stages:

Stage 1. The students were given an initial (pre-test) mathematical critical thinking ability test.

Stage 2. The instruction in Mathematical Analysis Course using the flipped cloud learning incorporating approach of advancing mathematical thinking (as shown in Table 3).

Stage 3. After completing the course, the students were given a second test (post-test) of their mathematical critical thinking abilities, the same as the first one (which contributed to their final grades). For this study, these abilities were measured using four indicators: fact analysis, selection of relevant information, mathematical formulation, and reasonable conclusions and references.

Stage 4. The scores were used for quantitative analysis to investigate the mathematical critical thinking abilities of the students.

The syntax and design of the cloud tools for the flipped cloud learning model with strategy for advancing mathematical thinking included the components shown in Table 4.

Table 4. The syntax and design of the learning activities and tools for education for each component in the cloud

Learning Activities	Cloud based tools in Google Classroom					
	Docs	Slides	Drive	Sheets	Meet	Video recording
Eliciting						
(a) Instructor prepares problems to stimulate students' thinking (in the cloud).	√					√
(b) Students express their thoughts and analyze methods to find answers by themselves through a cloud-based program where data can be collected.		√	√			
Supporting						
(a) Students are encouraged to think of similar problems and relevant concepts from the content that the instructor has posted in the cloud.	√					
(b) Students review basic knowledge related to solving problems, including the problem-solving process by searching the cloud.	√	√	√		√	√
(c) Further explanation of the students' solutions. Students and instructor together form conclusions.	√			√	√	
Extending						
(a) Interaction about the content that has been learned outside the class; students describe, give their opinions, analyze, compare and summarize mathematical knowledge.					√	√
(b) Instructor adjusts the conditions of the old problem or changes to new problems in the classroom and in the cloud.	√	√		√	√	√
(c) Preparation of electronic documents for students to challenge and engage them to find other methods and solutions.	√		√			

Research Instruments

The instrument used in this study for data collection was a test of mathematical critical thinking abilities (see Appendix A). This test related to the content learned during the flipped cloud learning experience and operational definitions of mathematical critical thinking ability. The test was constructed by the authors of this study based on the concept of real numbers systems and limits as part of the course. It consisted of a six items essay test, where each item had four sub-items. The students had to do the same tests they completed at the pre-and post-test stages which refers to the four indicators of their mathematical critical thinking abilities. The content validity of the test was reviewed and approved by three experts selected for their academic expertise and qualifications in mathematics. The authors of this study made some improvements to the tests based on the suggestions given by the experts before it was distributed. The difficulty index was in the range 0.22 - 0.79, the discriminant index was in the range 0.45 - 0.80, the reliability using Cronbach' alpha coefficient was 0.65, a medium reliability, and the McDonald's omega reliability coefficient was 0.84, which is considered appropriate.

Data Collection and Analysis

The data collected for this study consists of the scores from the mathematical critical thinking tests. The Statistical Package for Social Sciences 23 (SPSS 23) software was used to analyze the data. To check the significance of the findings, a preliminary test was performed first by testing the normality and the variance homogeneity of the scores with regard to the mathematical critical thinking obtained.

The normality test of mathematical critical thinking ability was performed using the Shapiro-Wilk test as presented in Table 5.

Table 5. Normality test

Test	Shapiro-Wilk		
	Statistic	df	Sig.
Pre-test	0.959	56	0.056
Post-test	0.990	56	0.924

Based on the Shapiro-Wilk test, the significance value for the pre-test was 0.056 > 0.05, and the significance value for the post-test was 0.924 > 0.05. Thus, it was concluded that the data were normally distributed at a significance level of 0.05.

The equality of variance using the Levene's test is shown in Table 6.

Table 6. Homogeneity test

Test	Levene Statistic	df1	df2	Sig.
Pre-test	0.139	1	54	0.710
Post-test	0.019	1	54	0.891

The value of the Levene statistic for the pre-test was 0.139 with a significance level of 0.710 >.05. For the post-test, the Levene statistic was 0.019 with a significance value of 0.891 > 0.05. Therefore, the data meet the assumption for the equality of variances.

The mean, standard deviation (S.D.), t-test, and normalized gain (n-gain) were used to analyze and calculate the quantitative data. A one sample t-test was used to consider the mathematical critical thinking scores compared to the 60% criteria. The paired samples t-test was used to compare the difference between the pre-test and post-test values, determined by the level of statistical significance ($\alpha < 0.05$).

The average score from the pre-test and post-test were analyzed using the following n-gain formula (Meltzer, 2002): $\text{n-gain} = \frac{X_m - X_n}{100 - X_n}$, where X_m is post-test score, X_n is pre-test score, and n-gain is normalized gain. The criteria for interpreting the n-gain level are given in Table 7.

Table 7. Interpretation of the criteria for the normalized gain level (Meltzer, 2002)

n-gain score	Interpretation
n-gain ≥ 0.7	High
0.3 ≤ n-gain < 0.7	Medium
n-gain < 0.3	Low

FINDINGS

The findings regarding the impact of using an advancing mathematical thinking approach with a cloud based flipped model on an online Mathematical Analysis course on students' mathematical critical thinking are shown in Table 8.

Table 8. Analysis of students' mean post-test scores regarding mathematical critical thinking compared with the required criteria

	N	60 percent of the full score	Mean	S.D.	St. Error Mean	t	df	Sig.
Mathematical critical thinking ability	56	18	19.36	3.26	0.43	3.109	55	.003*

*Note. *p<.05*

From the findings shown in Table 8, it can be seen that the mean mathematical critical thinking abilities score for students, after engaging with flipped cloud learning on advancing mathematical thinking was 19.36. The students had mathematical critical thinking abilities significantly higher than 60% at the .05 level.

To explore the improvement of mathematical critical thinking abilities before and after learning with the instructional method, we analyzed the normalized gain according to each indicator of mathematical critical thinking. The results are presented in Table 9.

Table 9. The average normalized gain score of mathematical critical thinking

Indicator of mathematical critical thinking	n-gain	S.D.	St. Error Mean	Interpretation
Fact analysis	0.42	0.29	0.038	Medium
Selection of relevant information	0.29	0.19	0.025	Low
Mathematical formulation	0.57	0.33	0.045	Medium
Reasonable conclusions and references	0.59	0.34	0.046	Medium
Average	0.46	0.28	0.038	Medium

The students gained the highest n-gain on the reasonable conclusions and references indicator, which was 0.59, at medium level. This was followed by the mathematical formulation indicator, which was 0.57, and the lowest score on the selection of relevant information indicator was 0.29. Overall, it was found that the average increase in students' mathematical critical thinking abilities was 0.46, which is considered as medium. This implies that using the flipped cloud learning approach with advancing mathematical thinking affected the students' mathematical critical thinking.

To investigate the significance of the conclusion above, the difference between pre-test and post-test mathematical critical thinking was determined by a t-test, which is shown in Table 10.

Table 10. The comparison of mathematical critical thinking for pre-test and post-test

Test	N	Mean	S.D.	St. Error Mean	t	df	Sig.
Pre-test	56	16.08	4.11	0.54			
Post-test	56	19.36	3.26	0.43	5.205	55	.000*

*Note. *p<.05*

It can be seen from Table 10, that the mean score for mathematical critical thinking for the pre-test was 16.08, and for the post-test, it was 19.36. There is a statistically significant difference between the pre-test and post-test scores examined by a dependent sample t-test, which found that the post-test score was better than the pre-test score. An effect size based on Cohen's d of 0.88 was a big difference. This verified that the treatment method was significant for eliciting students' critical thinking abilities.

DISCUSSION

The integration of cloud technology and advancing mathematical thinking strategy in flipped classrooms has been considered as an instructional approach for studying students' mathematical critical thinking abilities. After experimenting with this instructional approach, the mathematical critical thinking abilities of the students were higher than 60 percent, significantly. This may be due to the flipped learning model that provided students with opportunities to exchange ideas and collaborate, allowed them to solve problems independently and self-learn, which are ways of strengthening the ability to think critically (Kanjug, 2015; Sutama et al., 2020; Weinhandl et al., 2021). A cloud-based learning environment containing the eliciting, expanding and sharing of mathematical ideas and strategies encourages students to exchange knowledge, and to learn from and listen to suggestions from their classmates so they can fill in any gaps in their knowledge (Kraipiyaset et al., 2019). The findings of this study indicate that students had an average n-gain in mathematical critical thinking of 0.46, which was medium. This could be because learning performance was influenced by the instructional approach students experienced in the classroom (Goos et al., 2020). The application of cloud technology to advancing mathematical thinking in the flipped model improves the pedagogical process (Denton, 2012; Elena et al., 2019). When considering the top two highest-scoring indicators of mathematical critical thinking, mathematical formulation and reasonable conclusions and references, there is a medium average n-gain. This is consistent with the results of Wahyuni et al. (2019), who suggest that the flipped classroom process encourages students to explore their thoughts as a first step in practicing, which tends to result in better critical thinking. The students obtained the lowest score for the indicator of selection of relevant information with a low n-gain of 0.29. This may be because students were not yet able to consider the connections, relations and related concepts that must be used to solve a particular mathematical problem. Although the online learning environment contains activities involving interactions between students and instructors, some students are not in front of their screens all of the time. They may not understand some issues, and others may be unclear. However, thinking ability is a process that takes time to practice.

As the students had mathematical critical thinking abilities higher than before the experiment, at a statistically significant level of 0.05, this means students had better mathematical critical thinking abilities, which corresponds with the studies of Lai and Hwang (2016), Asmara et al. (2019), and Bangpoophamorn and Wiriyanon (2019). Further, this is in accordance with the findings of Saenboonsong (2017), who finds that undergraduate students' academic achievements, after learning with the flipped classroom model using cloud technology are higher than before. The learning outside of the classroom mode, listening to video discourses, taking notes or exploring other online learning resources, are all activities that can be done independently and flexibly. The students practice their analysis of knowledge by integrating their prior knowledge with unfamiliar content and forming conclusions by themselves (Sukonwiriyakul, 2017). The

cloud provides a space to exchange knowledge between students and between students and teachers, thereby giving students flexibility in reviewing and exploring contents (Boyinbode, 2018). In accordance with the study of Asmara et al. (2019), students' exploration and extension of thought will eventually develop their critical thinking. The findings are also in accordance with the previous studies of Asmara et al. (2019), Atwa et al. (2022), Kanjug (2015) and Kostaris et al. (2017). The cloud learning resources make difficult points of mathematical knowledge visible (Cen & Cai, 2017). In addition, the cloud technology comprises tools that support learning activities for accessing essential initial knowledge such as data retrieving and sharing and provides students with the facility to select pertinent information to solve problems (Denton, 2012; Wahyuni et al., 2019).

Some previous studies found that students were more motivated to participate in class activities than in remote mathematics learning; but found that they felt more relaxed when studying at home (Goncalves et al., 2020; Gonzalez et al., 2020; Lassoued et al., 2020; Surani & Hamidah, 2020). Even though it is now convenient for students to attend classroom lectures, teaching and learning mathematics can be adjusted according to epidemic prevention policies with the use of distance learning models (Mulenga & Marban, 2020). In terms of the learning environment, the findings correspond with other research (Giatman et al., 2020; Goncalves et al., 2020; Gonzalez et al., 2020; Riyanti & Nurhasana, 2021). Instructors are recommended to retain the quality of online learning materials and to prepare for any infectious outbreaks or similar situations, but especially for students' mathematical media literacy and for practicing critical thinking (Heyd-Metzuyanim et al., 2021).

The COVID-19 pandemic helped to facilitate an online instructional process that can be used for students' learning mathematics. The flipped cloud model is a teaching and learning management system in the digital world that uses technology to expand the learning experience and provides active, engaged learning for students (Iji et al., 2017; Kostaris et al., 2017). Because of the epidemic with students not in the classrooms, teachers have gained experience in distance learning by integrating technology with the teaching of mathematics based on the flipped approach. Any mistakes made during this learning process will have been identified and feedback provided based on the communication and interaction that has taken place.

It is generally recognized that both students and instructors have been affected by the spread of the COVID-19 virus. As an instructor, it is imperative to determine teaching approaches that allow students to participate in lessons as much as possible. Flipped cloud learning is one of the methods that can be used for mathematics instruction and is a tool for communication of all course activities. This method can provide instruction for any students or teachers infected or in quarantine due to COVID-19 because they can still attend or hold classes in the form of distance learning. Therefore, flipped cloud learning is an appropriate way to support students.

CONCLUSION

The use of technological tools to help learners to visualize mathematical points while allowing them to practice their thinking skills are a significant aid that every instructor must think about using when traditional teaching inside the classroom is not possible. Online or distance learning has been used during the COVID-19 pandemic as well as during periods when socially distancing was necessary. Understanding the application of technology is important to efficiently develop a mathematics teaching and learning model and critical thinking skills. The flipped cloud distance learning for this study was carried out online using G Suite platforms.

This study has examined the flipped cloud learning approach based on advancing mathematical thinking strategy, implemented on a Mathematical Analysis course for undergraduate students. The study aimed to analyze students' mathematical critical thinking abilities through learning with the treatment method. The evaluation was done before and after learning. In terms of statistical display, significant changes were indicated between pre-test and post-tests. The quantitative results revealed that the students increased their mathematical critical thinking more than the specified threshold. The findings of the study imply that a flipped model with cloud-based design for online mathematics learning enhances mathematical critical thinking. The results may support interested instructors and educators to apply the components in the model, contributing to the creation of a learning environment that emphasizes the thinking process, as

appropriate in their domain context. In addition, they can utilize the approach to enhance the performance of students' mathematical critical thinking abilities.

Although the flipped cloud learning model alone may not the best teaching and learning tool overall, it is the integration of technology with mathematics education that has allowed the teaching and learning process to continue and achieve success during the COVID-19 situation.

However, the study design was limited to one group. There was no control class to compare these results with, which would have provided more clarity. Therefore, further study is necessary that should include additional control groups as well as other strategies for teaching mathematics in the instructional model and which is supported by modern devices.

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APPENDIX A

A test of mathematical critical thinking abilities used as a data collection tool for this study.

1. Consider the text "The sum of a rational number and an irrational number is an irrational number."

   1.1 Clarify the keywords and describe the definition of keywords that appear in the aforementioned text. [Fact analysis].

   1.2 Write the relevant definitions, concepts, or theories needed to solve problems. [Selection of relevant information].

   1.3 Interpret the given text into a mathematical symbol and give the meaning of each symbol. [Mathematical formulation].

   1.4 Make conclusions from the given text (true or false) by deductive reasoning. [Reasonable conclusions and references].

2. Consider the text "The addition inverse of $\frac{1-\sqrt{5}}{2}$ is $\frac{-1+\sqrt{5}}{2}$"

   2.1 Clarify the keywords and describe the definition of keywords that appear in the aforementioned text. [Fact analysis].

   2.2 Write the relevant definitions, concepts, or theories needed to solve problems. [Selection of relevant information].

   2.3 Interpret the given text into a mathematical sentence and give the meaning of each symbol. [Mathematical formulation].

   2.4 Make conclusions from the given text (true or false) by deductive reasoning [Reasonable conclusions and references].

3. Consider the text "If $a \in \mathbb{R}$ and $a \neq 0$ then $a^2 > 0$"

   3.1 Clarify the keywords that appear in the aforementioned text. [Fact analysis].

   3.2 Describe the relevant definitions, concepts, or theories needed to solve problems. [Selection of relevant information].

   3.3 Interpret the given mathematical text into a text sentence. [Mathematical formulation].

   3.4 Make conclusions from the given text (true or false) by deductive reasoning. [Reasonable conclusions and references].

4. Consider the text "If x is upper bound of A and $y \in \mathbb{R}^+$ then $x + y$ is the upper bound of "

   4.1 Clarify the keywords and describe the definition of keywords that appear in the aforementioned text. [Fact analysis].

   4.2 Describe the relevant definitions, concepts, or theories needed to solve problems. [Selection of relevant information].

   4.3 Interpret the given text into mathematical model. [Mathematical formulation].

   4.4 Make conclusions from the given text (true or false) by deductive reasoning [Reasonable conclusions and references].

5. Consider the text "$\lim\limits_{n\to\infty} \frac{1}{\sqrt{n+5}}$"

   5.1 Clarify the keywords and describe the definition of keywords that appear in the aforementioned text. [Fact analysis].

   5.2 Describe the relevant definitions, concepts, or theories needed to solve problems. [Selection of relevant information].

   5.3 Interpret the given text into mathematical hypothesis. [Mathematical formulation].

   5.4 Make conclusions from the given text by deductive reasoning, summarize the conclusion with references. [Reasonable conclusions and references].

6. Consider whether the sequence $\{(-1)^n\}$ is convergent sequence.

   6.1 Clarify the keywords and describe the definition of keywords that appear in the aforementioned text. [Fact analysis].

   6.2 Describe the relevant definitions, concepts, or theories needed to solve problems. [Selection of relevant information].

   6.3 Interpret the given text and symbol into mathematical hypothesis. [Mathematical formulation].

   6.4 Make conclusions from the given text by deductive reasoning, summarize the conclusion with references. [Reasonable conclusions and references].

IMPLEMENTATION OF FLIPPED MODEL IN EFL READING CLASSROOMS

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ABSTRACT

Among many technology-enhanced teaching strategies, flipped classroom is one that gained popularity in recent years. This approach supports a more student-centered and communicative learning environment in English as a Foreign Language (EFL) classrooms. Although this approach is getting popular in the field, little research has examined the incorporation of flipped classroom approach in EFL classrooms. To address this gap, this study presented some tools to provide teachers an idea of how to flip a language classroom and make the learning process more active and communicative. Also, flipped classroom was examined through the eyes of EFL students. The data were collected through a learning experience questionnaire, focus group interviews and teacher observations. Descriptive statistics was used to demonstrate the mean scores of the questionnaire items. Content analysis was utilized for the interview data. The results revealed that EFL students had positive attitudes towards flipped classroom. Additionally, online assignments and discussion tasks were found to be useful for the implementation of flipped classroom in EFL reading classroom courses.

Keywords: EFL students, reading skills, flipped classroom approach, Edmodo.

INTRODUCTION

Most of the students of today are considered as part of the Millennium century and called as digital natives. They prefer to learn in an environment with continuing developments of technology (Prensky, 2001). Since expectations of today's learners are discrete, their learning styles are divergent from their predecessors as well. Savion (2016) exemplifies this with the use of MOOCs (Massive Open Online Course) for searching and finding information instead of encyclopedias. Accordingly, the advancements in technology and changes in learning profits have changed the instructional approaches. Moreover, the sudden transition to online education during the COVID-19 pandemic lead to an evolution in teaching methodologies. With this unplanned transition, several problems arose related to teacher-student interaction, time management, accessibility of materials and assessment.

The use of technology in English as a foreign language (EFL) class has changed the teacher-centered instruction into a more student-centered, interactive and communicative-based approach. Various technology-enhanced teaching strategies have been developed to strengthen student interactivity and active involvement. One of the most common methods transformed student-centered instruction is flipped classroom model, which can simplistically be defined as "school work at home and home work at school". The present study followed the recent meta-analyses related to flipped learning (e.g. Låg & Sæle, 2019; Vitta & Al-Hoorie, 2020) and adopted a general definition which is "A flipped intervention first involves presentation of new content to learners to be independently studied before class, and then class time is devoted to reinforcing and engaging with the 'flipped' content". Although the flipped classroom has become increasingly popular (Chen Hsieh & Huang & Wu, 2017; Goodwin & Miller, 2013), there is little research that supports the effectiveness of the flipped classroom in EFL reading skills classrooms (Al-Amri, 2022). Most of the studies on flipped classroom have been in various disciplines such as science, technology, engineering, and math (STEM) (Berrett, 2012; Vogelsang et al., 2019). Regarding the use of flipped model in language classes, Filiz and Benzet (2018)

reviewed 50 studies. Speaking and writing were the most commonly researched areas in language teaching (Filiz & Benzet, 2018; Hashemifardnia, Shafiee, Rahimi Esfahani & Sepehri, 2021; Turan & Akdag-Cimen, 2020). Thus, more research on flipped learning interference is a need to apprehend deeply how useful and effective flipped classroom is within the multidimensional L2 reading context. The present study shows an attempt to help EFL teachers create their own flipped classrooms by trying a variety of tools in an EFL class. Moreover, the article examined EFL students' beliefs on flipped classroom in an EFL reading skills class.

LITERATURE REVIEW

Flipped Classroom Approach

In a traditional classroom, the instructor gives lecture in the class and gives assignments to be completed after the class. In such classes, students listen to the teacher and complete the assignments passively. This results commonly in low student satisfaction and engagement. On the contrary, flipped classroom changes the mindset of class time and direction of focus from teacher to student. Flipped classroom model provides opportunity to students to get prepared for the class and identify knowledge gaps that need to be clarified (Mehring, 2016). This model of classroom enables teachers to elevate the discussion time, provide some authentic examples and tasks related to course content, increase students' critical thinking skills and monitor students' learning process (Flipped Learning Network, 2014).

Nowadays, flipped classroom approach has got attention of good deal of educators and researchers in online movement in education because of COVID-19 pandemic. Thus, flipped classroom approach in English language learning and teaching depend on various technological techniques which enable students to become more interactive inside and outside the class and have more opportunities for further development and confidence in their academic language proficiency (Kawinkoonlasate, 2019).

The flipped classroom model necessitates some in-class and out-class activities. Some typical in-class activities for flipped classroom are quizzes, group activities, students' presentations, problem-solving, mind-maps and discussions. The out-class activities include reflections, quizzes, presentations, research projects, discussions, readings, and videos (Akcayir & Akcayir, 2018; Al-Amri, 2022; Nugroho, Basari & Maryano, 2020).

Theoretical Foundations

The flipped classroom approach dates from constructivist learning theory which emphasizes the eminence of learners' role in their learning process. This approach may encourage them to become active learners while improving their engagement in the class (Aycicek & Yanpar Yelken, 2018).

The flipped classroom approach comprises of two elements which are receiving instructional content from online media such as articles, videos or some other outside class learning activities and using interactive in-class activities. According to Morton and Colbert-Getz (2017), flipped classroom approach is based on the high levels of knowledge inside the classroom and low levels of knowledge outside the classroom. Almasseri and AlHojailan (2019) claimed that Bloom's Taxonomy is helpful to classify knowledge and helps instructors to set objectives and assessment tools. Bergmann and Sams (2014) claim that prior to face-to-face class, lower-level content can be done through articles, videos or other outside class learning activities. That is to say, lower content might be the lower levels of Bloom's Taxonomy such as remembering and understanding. Moreover, higher level content covered as in class activities target the higher levels of Bloom's Taxonomy which are applying, analyzing, evaluating, and creating. In this way, students' higher-order thinking skills can be developed in class (Ho and Lam 2016; Lee & Lai, 2017; Liu & Zhang, 2022). In the form of flipped classroom model, students first get exposed to the learning process through readings, videos, mind maps or e-notes before the class hour. During the class time, the focus is to process this learning through analysis, discussion, syntheses, problems or case based learnings or group learning (Bishop & Verleger, 2013).

Vygotsky's (1978) Zone of Proximal Development (ZPD) is another rationale underlying the flipped classroom approach. The principle of ZPD focuses on the differences what individuals can do independently with the help of problem-solving tasks followed by solving a problem with a peer or more knowledgeable person through collaboration. In a flipped classroom, learners benefit from lower-level and higher-level

cognitive studies within the context of ZPD. Learners are first responsible for pre-class task(s). Later, the inside classroom time is used to fill gaps between what has been learned in pre-class tasks and the ability to perform the knowledge which still need guidance or peer collaboration. Students have discussions and presentations with their peers which may enable them to realize, analyze or evaluate different subjects with different perspectives (Yildiz Durak, 2022).

The Flipped Classroom for Language Learning

Over the last decade, flipped classroom approach has been used commonly in diverse STEM-related fields but it also attracted language educators' attention (Brinks Lockwood, 2014; Kostka & Marshall, 2017). Previous studies designated that flipped classroom approach also improves EFL learners' language skills incorporating writing, reading, speaking, grammar and listening (Ahmad, 2016; Song, 2015). Huang and Hong (2015) signified that flipped classroom has a positive, significant, and quick impact on experimental groups' information and communication technology (ICT). Flipped classroom was found to promote learners' engagement and enhance their learning motivation. Moreover, the results demonstrated that students also strengthen their English reading comprehension abilities quickly and effectively. Farsi et. al (2022) suggested that flipped teaching raised students' awareness related to reading strategies. Flipping the reading skills class also helps learners to lower their reading anxiety and perform better regarding EFL reading (Mohammaddokht & Fathi, 2022).

Sun (2017) discovered that flipped classroom approach helped learners to use varied learning strategies. Moreover, content-based instruction in flipped classroom promoted comprehensive input and chances with reference to meaningful use of language. The cooperation design enabled students to dig deeper into the subject matter and benefit from each other's comments. Previous studies additionally examined the effectiveness of the flipped classroom approach through pre-test and post-test or by comparing it with traditional teaching. It was found that flipped classroom approach is more effective than traditional teaching (Boyraz & Ocak, 2017; Cetin Koroglu & Cakir, 2017; Ekmekci, 2017; Huang & Hong, 2016; Yu & Wang, 2016).

Although research on effectiveness of flipped classroom designated a positive result in previous studies, Mehring (2016) detected that most EFL teachers hesitated to flip their classes since the workload was heavier than traditional classes. Lee (2019) also found that pre-service EFL/ESL teachers had some concerns regarding flipped classroom approach. They claimed that learners' technology access and technical ability might be limited which may cause problems during the learning process. Moreover, it was found to be risky to rely on students taking responsibility for their own learning.

Student Perceptions of Flipped Learning

A number of studies on students' perceptions of the flipped classroom have been administered in a variety of fields including language teaching. The previous studies certified that majority of the students have a positive attitude toward flipped classroom (Farsi et. al, 2022; Samiei & Ebadi, 2021). Sun (2017) reported that students' attitudes and personal gains were positive toward the content-based flipped classroom approach in terms of content knowledge and language gains. This result supported Valeo's (2013) study that indicates students are more motivated and participate more willingly when they focus on something distinct than language itself. On the other hand, students' perceptions about teacher involvement varied because some were in the idea that an appropriate degree of teacher involvement was necessary while others like the idea of learning by doing and discovering independently. Mehring (2016) additionally discovered that some students were less positive about self-regulated learning videos and some of them felt uncomfortable with this approach.

Mok (2014) and Enfield (2013) stated that students found instructional videos and following embedded quizzes and self-evaluation questions helpful, engaging and appropriately challenging to study on their own pace. Another finding related to student perceptions of flipped learning was stated as "this model enabled weaker but diligent students to study at their own pace and come to class as prepared as their stronger contemporaries. This could have helped build up their confidence and enjoyment of the subject matter" (Mok 2014, p. 10).

Although majority of the previous studies found positive perceptions towards flipped classroom, mixed or negative perceptions were also reported. Chen Hsieh et al. (2017) stated that most of the students found pre-class tasks helpful but found the in-class activities (e.g., team teaching, discussion, problem sets) confusing. Moreover, some students shared that they could not learn through group activities in class since not every student was participating equally. In a similar vein, Khanova et al. (2015) found that minority of the students expressed pre-class modules heighten their learning. Thus, students described the flipped classroom as self-taught learning, and they shared that they feel the lack of teacher guidance.

These positive, negative and mixed responses of students indicate the prominence of keeping a good balance between in-class activities and out-of-class learning tasks.

Tools for EFL Flipped Classroom

With the developments of technology and the spread of COVID-19 virus, a high number of computer applications with reference to language learning and teaching are used in EFL classes. It promotes both synchronous and asynchronous learning and teaching methods. The flipped classroom also depends on utilizing distinct digital technologies and tools such as videos, websites, and online discussion boards. Flipped classrooms use instructional materials instead of teacher lectures. Picture-based vocabulary tasks, videos, presentations or reading texts are some of the sample tasks that students interact with when they are at home. Some of the effective tools to be used in flipped classroom are Edmodo, Google Classroom and YouTube (Aydin & Demirer, 2017; Urfa, 2018)

1) Edmodo is a free educational social media which is usually called as "Facebook for Education". It was launched in 2008 but it has been one of the top learning tools for education. Warawudhi (2017) designated that it is an effective web-based learning environment because it makes the learning process more interesting and engaging (Dere & Yalcinalp, 2016). Moreover, it combines individual and collaborative tasks. Teachers cannot only upload texts, audio, and video files but also create assignments and quizzes. Students can study via computer, smartphone or tablet anywhere they want. Moreover, they can engage in discussion boards regarding the assigned task.

2) Google Classroom helps instructors to store all instructional materials in one place. Using it in the flipped classroom helps learners to combine other features of google such as Drive, Docs, Sheet, and Gmail. Thus, it might make the process easier for both teachers and students (Cobena & Surjuno, 2022).

3) YouTube is widely used in language classes as supplementary material for better understanding and knowledge of the lectures (Aydin & Demirer, 2017). Moreover, it makes the learning process more engaging and fun for students. YouTube has been favored by all ages because it provides learners and teachers with authentic situations that will help learners to improve their performance in English. Hence, YouTube can be functional in flipped classrooms in dealing with learners' difficulties and barriers.

All the tools listed above can help to create a flipped classroom. The technology helps more for learner autonomy, time to practice the theory and more time for hands-on activities. With the help of these tools, learners can study on their own outside or inside the classroom by individualizing their learning experience.

PURPOSE OF THE STUDY

By means of the full-time online education, engaging students in the class became more difficult than face-to-face education. There are divergent reasons why some students lost their motivation or interest in their classes. Some of them got tired or did not enjoy listening to lectures in front of the computer or others got distracted in online learning (Al-Nofaie, 2020). To solve this problem, a more dynamic and interactive learning environment in which the instructors guide students as they practice concepts and engage creatively in the subject is needed.

The present study was conducted by means of a group of Turkish first year English Language Teaching Department students who took reading skills-II course. The goal of the present study is to expand the current understanding of flipped classroom approach in the language teaching area. Moreover, it is significant to

examine and apply the approach for pre-service teachers because previous studies displayed that EFL/ESL teachers have some hesitations to implement the approach (Kiang & Yunus, 2021). Therefore, the aims of the study were to examine the use of flipped classroom tasks in an EFL classroom and describe pre-service EFL teachers' attitudes towards utilizing the flipped classroom. In line with the aims of the study, the following research questions guided the investigation:

(1) What are Turkish students' attitudes towards using flipped classroom approach in EFL reading classroom?

(2) Which tasks were useful for the implementation of flipped classroom in an EFL reading classroom?

METHOD

Research Design

A mixed-methods model permitting both quantitative and qualitative data collection and analysis was utilized in the present study. This method enables a deep picture for the reality of the practical situation being researched. In such model, quantitative analysis is used to test and approve hypothesis and gain understanding of predictors (Teddlie & Tashakkori, 2003). On the other hand, qualitative analysis is used to obtain a broader understanding which includes the reasons for the outcomes (Robins, Ware, dosReis, Willging, Chung & Lewis- Fernandez; 2008).

Context

The present study was conducted in an English Language Teaching Department of a foundation university in Istanbul, Turkiye. The research was implemented in a Reading Skills- II course offered in spring 2020. The course was offered as a must for undergraduate first-year English Language Teaching department students. This course lasted 15 weeks, with one session per week of two hours. The instructor was the researcher and had taught the course twice. While teaching the course, the teacher realized that too much time on reading was spent. Students also reflected that reading the materials before the class hour helps more to apprehend the content and participate in in-class activities. Therefore, the researcher decided to flip the class by required reading texts and pre-class quizzes. More detail how the researcher flipped the classroom is given below in treatment and procedures section.

Participants

55 freshmen Turkish EFL students between the ages of 18-22 participated in the study. All of the participants passed the proficiency exam and matriculated into their departments. Thus, their language proficiency could be described as somewhere in between B2 and C1 according to Common European Framework for Languages. All the participants were enrolled in a Spring 2020 reading skills course. The mode of instruction was online because of COVID-19 crisis.

Before each class, the students were guided to study on the lesson materials such as reading a text, watching a video and completing a pre-class quiz. Then, they did various in-class activities such as creating a mind map, having discussions on reading comprehension questions asked by the instructor on weekly readings, writing thought provoking questions and answers on weekly readings, and preparing picture-based discussions in groups. All these tasks were done on Edmodo since the students used this LMS in their previous years. Therefore, they knew how to access or download the materials, post a question or comment and upload an assignment.

Data Collection

The researcher, who was the instructor of the course, came together with the participants every week regularly for two hours. Before collecting the data, participants signed a consent form to participate voluntarily in the present study. The weekly readings were sent to students two days before the class. A day before the class, they were also required to complete an online reading comprehension quiz.

1. Questionnaire

To measure attitudes of students on flipped classroom approach, a learning experience questionnaire (LEQ) of Haghighi et al. (2019) was employed. The questionnaire contained 20 questions in a 5-point Likert scale (See Appendix #1). The LEQ measures students' attitudes towards the treatments they had received in six constructs: motivation, usefulness, engagement, autonomy, anxiety, and satisfaction. All participants signed an informed/consent form to participate voluntarily in the current study.

2. Focus Group Interviews

Focus group interviews were conducted with 10 volunteer participants. The aim of the interview was to obtain insights in correspondence with participants' attitudes towards the flipped classroom. Four in-depth questions were asked to grab detailed information about students' attitudes towards the treatment. Each interview lasted around 40-45 minutes. The interview data was recorded and transcribed by the researcher. In order to optimize the participants' range of expression, they were free to use either Turkish or English. The participants signed an informed/consent form to participate voluntarily in the focus group interview. The following questions were asked during the interview:

1. What do you think of the flipped classroom in comparison with your regular classes in terms of time and effort you made, effectiveness, and your reading skills?
2. Did you face any problems during this experience in terms of materials, article contents, communication tool (e.g., Edmodo) used for Q&A, and activities?
3. How do you think the flipped classroom you experienced can be improved?
4. What was your favorite part of flipped classroom?

3. Teacher Observation

A systematic classroom observation was conducted to measure classroom behaviors from direct observations that specifies both the events and/or behaviors. Field notes collected in observation data included how competitive, cooperative, and enthusiastic students were while doing the tasks, the type of questions they asked to the teacher and each other, and the amount of time they spent on the tasks.

Treatment and Procedure

The students participated in a 9-week intervention of flipped classroom on Mondays via Zoom meetings. The two hours EFL reading class followed the following procedure and tasks as it is also seen in Table 1.

1. Reading the required article two days before the class.
2. Completing an online quiz on Edmodo to check their reading comprehension one day before the class (see Appendix #2). The teacher gave feedback on their quiz during the class hour.
3. Warm-up by mind-mapping regarding the required article (see Appendix #3). The teacher shared a whiteboard on the Zoom screen, wrote the topic of the article and students wrote whatever comes to their mind related to the article on the whiteboard. After they finish the mind map, they had a class discussion on their notes.
4. Class discussions were held to check students' comprehension. The teacher asked a number of open-ended reading comprehension questions.
5. Picture-based discussions were implemented at the end of the class. The students took or found a picture related to the weekly reading as a group and utilized their pictures as the topic of discussions. Each week, one group led a discussion based on their picture.
6. Discussion board was used after the class (see Appendix #4). The students were asked to post one thought-provoking question about the related topic each week and answer at least two of their friends' questions on the Edmodo class page. They were given 24 hours to finish this task.

Table 1. In-class and out of class activities used in each session

Class	In-class activities	Out-of-class activities
Reading	Mind map	reading the required article
Skills	Feedback on pre-class quiz	pre-class quiz
	Answering RC questions	discussion board
	Picture-based discussion	

Data Analysis

With respect to the first research question, the attitudes of participants toward the flipped classroom intervention in EFL reading classes a learner experience questionnaire and focus group interview were employed. Descriptive statistics were used to illustrate the mean scores of the participants for each item of the questionnaires. The interview results were analyzed by content analysis. The three Cs strategy was used, which includes coding, categorizing and concepts, to find major themes in interview data (Litchman, 2014). An inductive process in which the researcher discovers major themes and categories from a specific data was done. In the end, similar findings were labeled, and sub-themes were grouped to highlight the theme in the data.

As for the second research question, the teacher's observation notes were used to qualitatively analyze the level of participants' engagement in-class activities. During the lesson, the teacher took notes whatever attracts her attention. After the lesson, she organized her notes and added more detail. These notes were conducted systematically for each week. The three Cs strategy was again utilized by using the similar process.

FINDINGS

Students' Attitudes towards Flipped Learning Experience

In order to investigate Turkish students' attitudes towards utilizing flipped classroom approach in an EFL reading classroom, the Flipped Learning Experience questionnaire was conducted. The questionnaire embraced six constructs which are usefulness, autonomy, engagement, satisfaction, motivation, and anxiety. Table 2 displays the descriptive statistics for student attitudes measured by the questionnaire. Table 2 indicates that students' attitudes towards flipped classroom in EFL reading class was positive with the mean scores of 3.75, 3.56, 3.50, 3.50, 3.23 and 3.61 for usefulness, autonomy, engagement, satisfaction, motivation, and anxiety, respectively.

Table 2. Descriptive statistics of attitudes towards flipped classroom experience

Construct	Mean	SD	Min.	Max.	N
Usefulness	3.75	0.72	2	5	55
Engagement	3.56	0.69	1	4	55
Satisfaction	3.50	0.86	1	5	55
Motivation	3.23	1.05	1	5	55
Anxiety	3.61	1.02	1	5	55

According to Table 2, flipped classroom was (1) useful and supportive for their learning process, (2) helpful to elevate learner autonomy, (3) encouraging to engage in the process of learning, (4) giving learners satisfaction with their learning process, (5) motivating students to comprehend the reading materials well, and (6) reducing their anxiety. The results for each construct have been expanded below.

Usefulness

57% of the students were positive about the flipped classroom. They found flipped classroom tools useful and supportive for their learning process. Moreover, the students believed that flipped classroom helped them to learn more and better (Q1 to Q4)

Autonomy

Majority of the students agreed that flipped classroom encouraged them to regulate and control their own learning activities. Flipping the classroom gave them the opportunity to practice the content on their own at home before the class time. Moreover, the students preferred flipped classroom rather than regular classes thanks to the immediate feedback (Q5 to Q8)

Engagement

Based on the results on Q9 to Q12 of the questionnaire, 57% of the students agreed or strongly agreed that flipped classroom encouraged them to engage more than regular classes. Since they spend more time and effort for the flipped classroom, they feel more confident to participate in the class activities. Thus, it can be said that flipped classroom materials such as articles, online quizzes, mind maps, Q&A discussion board increased the student participation time.

Satisfaction

The results of the fourth section of the questionnaire (Q13 to Q16) designated that students were satisfied with the flipped classroom model. While 47% of them agreed or strongly agreed that flipped classroom experience was satisfactory, 34% of them were neutral. For the Q16 which stated "I plan to register in flipped classrooms for other subjects in future", 45.4% of the students chose to agree or strongly agree. This reveals students were satisfied with format and structure of the flipped learning materials.

Motivation

Results of Q17 to Q19 revealed that students were motivated to get prepared for the class prior to the class. These materials prior to the class helped them to take the course more serious, spend more time on studying the subject and feel more motivated.

Anxiety

With regard to the last part, 60.1% of the students agreed or strongly agreed that flipped classroom reduces their anxiety level. Since students do the lecture time at home on their own, they get some background information about the subject and do not fear of failing.

Focus Group Interview

With 10 volunteer students among the same group, an interview was conducted on their flipped classroom experiences. With regard to the first question (see Table 3), the majority of the students claimed that they spent similar amount of time for flipped classroom in comparison with their regular classes. Nevertheless, they specified that the time they are spending prior to the class is more effective thanks to the required tasks in flipped classroom. They all specified that out-of-class materials provide them some background information concerning the subject. Moreover, all of the students believed that it is very effective to use flipped classroom model in EFL reading skills class because they usually cannot concentrate on reading long texts during the class hour. When they had the opportunity to read the required articles beforehand, they had the chance to look up for unknown words, re-read the complex parts and analyze the text. Since they spent the reading time out of the class, they remarked that they could spend more time on in-class activities. Moreover, one of the participants stated that he felt more prepared mentally for the class discussions after reading the article and completing the

tasks on his own pace before the class hour. Similarly, another student claimed that she developed her critical thinking skills by reading the articles priorly. In traditional classes, students are generally given 10-15 minutes to read a passage. This time might not be enough for everyone to read deeply.

Table 3. Percentage and frequency-based results for 1st interview question

Category	%	f	n
Effective	100%	10	10
Similar time	80%	8	10
Positive reading outcome	70%	7	10

All of the participants believed that flipped classroom materials were functional for reading skills class. They liked completing an online quiz related to the article before the class because this encouraged them to read the article. Some of them asserted that they would not read the assigned articles if they did not have the quizzes.

In response to the second question (see Table 4), none of the students faced with any serious problems during this flipped classroom experience in terms of materials, article contents, communication tool (Edmodo) for Q&As, online quizzes and other activities. They found Edmodo a user-friendly app and made the communication easy. Three of the students shared that reading the articles out of the class was sometimes difficult because of their heavy schedule. When they did not read the assigned article, they could not participate in the class. At such times, they felt as they ruin the flow of discussion in class activities.

Table 4. Percentage and frequency-based results for 2nd interview question

Category	%	f	n
Positive	70%	7	10
Negative	30%	3	10

With regard to the third interview question (see Table 5), students were asked how the flipped classroom could be improved. The students enjoyed flipped classroom in general but made a few suggestions. One of the participants suggested to add online games to flipped classroom. Another student spotted that the use of quiz was very effective but she said another quiz after the class can be implemented. The last comment to improve flipped classroom was to elevate the grades of out-of-class activities. Since most of the students receive grade-oriented education in Turkiye, one of the biggest motivations for them is their grade.

Table 5. Percentage and frequency-based results for 3rd interview question

Category	%	f	n
Online games	10%	1	10
Post-quiz	10%	1	10
Grade	10%	1	10
Satisfied	70%	7	10

With regard to the last question, the most favorite part of the flipped classroom was the Q&A discussion boards. Students liked the opportunity to discuss the topic on an online platform out-of-the class. One of the students specified that she enjoys reading other questions more than writing her own question. She noticed that very good thought-provoking questions arose from students who are very silent and mostly passive in the class. The other favored part of flipped classroom was creating a mind map at the beginning of the class based on the assigned article. The mind map helped them to recognize some substantial parts they have missed while reading.

Category	%	f	n
Q&A	90%	9	10
Mind-map	70%	7	10

All of the participants added that they found flipped classroom very useful for reading class. They were all aware of the fact that the effectiveness of flipped classroom might change depending on the course content. For example, one of the students specified that this model might not be appropriate for a writing class but was perfect for the reading class.

Teacher Observations

The researcher, who is also the teacher of the class, conducted observations systematically incorporating class procedure and student behaviors. Online quiz which was shared a day before the class was found to be helpful. In the initial two weeks of the semester, students did not receive any pre-class task except reading an assigned article. It was observed that some students came to class without reading the article. Thus, this problem was solved because students had to read the article to complete the quiz. Moreover, it was observed that students read the articles more critically when they were required to complete a quiz. Students could maximize class discussion by performing this task.

Creating a mind-map related to the topic of the week was found to be engaging. In online education, students are usually passive. Having access on the zoom screen made them participate willingly. They wrote whatever comes to their mind in accordance with the article. Then, they were expected to explain what they meant by that word and how it was related to the topic of the week. Five minutes was spent on creating a mind map and 15 minutes to have a discussion on the mind map. This task helped students to activate their knowledge concerning the article. Moreover, the discussions enhanced their production of refusal.

Since students were required to read the weekly articles before the class hour, not extra time was spent for in-class reading. Only five minutes was given to skim the text. Reading the assigned materials in advance and performing the required tasks motivated students because they felt more confident about the topic. By this way, active class participation was achieved, and the class was managed in a discussion format rather than a lecture format. All the discussion questions asked by the teacher were related to the required article. These questions aimed to think more deeply on the topic by having a class discussion. The articles shared by the teacher improved their reading skills and the discussion questions asked by the teacher enhanced their critical thinking skills and oral proficiency level. The class discussion based on the teacher questions lasted approximately 35 minutes.

Each week, one group led a picture-based discussion related to the assigned article. The group talked about the assigned topic and asked some questions related to the topic. Although the discussions were carried out successfully generally, some groups made it into a presentation rather than a discussion. Thus, this was a difficult task to handle in online classes.

Edmodo used for the Q&A activity was a convenient platform for language learning because of its easiness of use. Students were required to write thought provoking questions related to the assigned article and answers to their friends' questions. They did not find writing a question an easy job but they enjoyed it. Discussions were effective and gave chance to practice more after the class.

DISCUSSIONS AND CONCLUSION

The present study examined the use of flipped classroom tasks in an EFL reading skills class and described EFL students' learning experiences of such a model of instruction. The results of the study revealed that (1) students had a positive attitude towards flipped classroom and (2) online assignments and discussion tasks were useful for implementation of flipped classroom in an EFL reading classroom.

Overall, most of the EFL students had positive attitudes towards flipped classroom (Farsi et. al, 2022; Samiei & Ebadi, 2021). Majority of the participants believed that the flipped classroom was more engaging than traditional approaches (Mohammaddokht & Fathi, 2022). Participants also indicated that they enjoyed having a learner community in which they can ask some though provoking questions and think critically to comment on each other's' questions. Additional to the in-class discussions, participants also appreciated having out-of-class instructional tasks. The implementation of the discussion board was somewhat similar to that of Fautch (2015) and Lee and Martin (2019). While it was not clear whether students detected the discussion boards beneficial in Fautch's (2015) study, students in Lee and Martin's (2019) study appreciated to use discussion boards.

Participants shared that they were more motivated to read the assigned articles regularly due to the assigned online tasks. The results of the present study seem to be consistent with research conducted by Fautch (2015), Mok (2014) and Vaughan (2014) in which students are more willing to take control over their learning in a flipped classroom. Participants found the pre-class tasks especially helpful because they developed their critical thinking and problem-solving skills (Yulian, 2021). They enjoyed to completing pre-class tasks which gave them opportunity to gain control when learning in a flipped classroom (Braun et al, 2014). Students indicated that they could learn at their own pace and practice the pre-class learning tasks many times if necessary.

There is the concern that flipped learning generally dependents on student participation. In this study, this concern was providing the students articles and online quizzes in which they were required to complete before the class hour. Similarly, Haghighi (2019) assigned students with were required to complete study log and send their learning result to the teacher before the class. They also spotted that pre-class tasks increase student participation.

The findings from this research not only strengthen the understanding of the students' attitudes towards the flipped classroom instructional strategy but also display how to implement a flipped classroom in practice. The implementation of a flipped classroom in an EFL teacher-training environment led to gain a better understanding of the instructional value and challenges of the flipped classroom. Moreover, flipped classroom provide various opportunities to EFL students to use the language more communicatively and collaboratively. In addition to developments in their language proficiency, flipped classroom increases learner autonomy, motivation, engagement, satisfaction, and confidence. All in all, it can be suggested that teachers can design their EFL reading courses by flipping the class to devote more class time to communicative tasks that allow for a more efficient use of class time (Maharsi et. al, 2021).

Limitations and Implications

There are some limitations in the present study that need to be acknowledged. First, this study was administered on the researcher's own students. Future studies could be done with other participants to affirm that the findings were not influenced by any bias made by the researcher. Second, the sample size might be bigger to confirm the positive effect of flipped learning on EFL reading skills. The number of students who answered the questionnaire was limited to fifty-five. Finally, the effect of flipped classroom on EFL students' reading skills could be compared with an experimental group. These two groups can be compared taking account of their reading skills development.

In this digital age, teachers should integrate information and communication technologies to their classes in order to motivate students to participate actively. This became a concern of teachers particularly in the process of COVID-19 pandemic. Flipped classroom can be implemented in face-to-face, online and blended learning environments. Teachers can diversify the classroom activities with flipped model so that they can manage a more active and engaged learning environment. Moreover, students' critical thinking skills can be developed with the help of flipped model in EFL reading skills courses.

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Learning Experience Questionnaire

No	Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	I learned more and better In the flIpped classroom than regular classes					
	The flipped classroom helped me to use refusal strategies more appropriately in real life					
	My knowledge of the subject increased as a result of flipped classroom					
	The flipped classroom has useful tools for supporting my learning.					
	I have developed self-study skills via flipped classroom activities.					
	Flipped learning gave me more time to practice the content					
	Thanks to flipped classroom, it is more convenient and easy for me to study English at home					
	I would rather flipped classrooms because I receive immediate feedback					
	I spent more time and made more effort than usual on my flipped classroom learning activities					
	We have the chance to participate in the class activities more than before in flipped classrooms					
	The flipped classroom gave me more opportunities to interact with other students					
	The flipped classroom is more engaging than conventional classroom instruction.					
	Overall, I am satisfied with flipped classroom experience					
	I found that following the flipped classroom procedures gave me a sense of deep personal satisfaction					
	I am satisfied with the format and structure of the learning materials					
	I plan to register in flipped classrooms for other subjects in future					
	I was eager to read the articles and other materials set for this course prior to the class					
	The structure and format of flipped classrooms motivated me to take the subject more seriously and spend more time on learning them					
	I feel more motivated about learning English because of the flipped classroom					
	The use of the flipped learning reduces the feeling of fear and tension because of the prior preparation					

APPENDIX 2

A Sample from the Online Quizzes

Sorular	Total Questions: 5 | Total Points: 7

1. What are the reasons of decrease in mortality rate?

Birden Fazla Cevap (3 puan)

2. Children of educated mothers are more likely to survive than children of mothers with no education.

Doğru/Yanlış (1 puan)

3. All countries achieved universal health coverage and provide access to safe and affordable medicines and vaccines for all including women, men and children.

Doğru/Yanlış (1 puan)

4. How can you define a guardian of health?

Kısa Cevap (1 puan)

5. Explain shortly what "Tosepan Pajti" is.

Kısa Cevap (1 puan)

A Sample from the Mind-Maps

mental health awareness

exercise

Japan has the highest average age in the world

health care services

robust

vaccine

hospital

energy

sport

health care service   Healthcare system   being active

stress management

murat: sweden

doing exercise

good living conditions

good habits   ıtır: nutrition

Good Health and Well-Being

good nutrition

being fit

Education

medicine

medical

peace

well-being

quality sleep   assistance

evrim:biology sciences

yoga

physical exercise

vaccine   mental health

accessibility   eating habits

healthy life style   japan

mental and physical condition

healthy diet

hospitals

healthy diet   Doctor

happiness

welldeveloped countries

japan

Respecting people

having opportunities

A Sample from the Discussion Boards

Can the quality of education be improved without a certain amount of money?

Tercüme et

2 Beğeniler • 6 Replies • 22 Mar 2021, 4:50 PM

Daha fazla cevap göster...

Of course, it can be improved without a certain amount of money. I firmly believe that money should not be a matter when education comes into question. In my opinion, the most important factor in education is the qualification of the teacher. What ı mean is if the instructor is well equipped then money does not change anything including the quality of the education. Moreover, still, there are many well-known schools which provide many facilities; therefore, students are able to socialize and engage activities but other than the social activities students cannot receive any proper education from teachers because instructors are insufficient.

Tercüme et

Beğen • Mar 23, 2021, 9:07 PM

I think it is impossible. Without any investment in education, there will not be a qualified education. The essential part of qualified education is teachers' quality, facilities, and equipment. All of these needs require some money. If the money is not a need for a qualified education, so why is the number of uneducated people in poor countries high? Every country which considers their citizens must allocate some money for education. However, it is not only money that is needed for education. Also, a country should arrange a system of education. Every student should reach a qualified education. Teachers should be well-educated.

Beğen • Mar 23, 2021, 10:29 PM

The article mentions that girls do not have the same equalities to study as boys. How do you think this affects society?

Tercüme et

Beğen • 4 Replies • 22 Mar 2021, 5:11 PM

Daha fazla cevap göster...

With gender equality in education, great developments can be achieved since the inequality in the education field blocks the nurturing of young girls. Significant growth in the economy is also achievable with equality in education. When women receive the education they deserve to get, they can help to improve the conditions the society lives in. Education allows women and men to participate in social, economic, and political life and provides the basis for the development of a democratic society.

Tercüme et

1 Beğen • Mar 22, 2021, 10:49 PM

The cause for it is the culture of those people, their opinions and such cause this. The way this affects societies can be given examples from a lot of situations. One of them is the mother role of the woman. These women are usually married at an early age, because they lack education, proper knowledge in many things they can't grow children properly. This way the growing child is not grown properly, if not gets better, these children create a cycle and this bad culture continues. Another one could be that as genders have different natures, girls are the balancers of the society (imo). If they are not educated enough, they might lose their influence. By that, I mean the effect they deliver can get scarred, especially in some cultures.

ONLINE BIOCHEMISTRY DISTANCE LEARNING: DENTISTRY STUDENTS' PERCEIVED OPPORTUNITIES AND CHALLENGES

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ABSTRACT

Undergraduate courses such as biochemistry were prompted to embrace online distance learning triggered by the incursion of the COVID-19 pandemic. This study worked to help solve the issues and concerns related to teaching biochemistry as a foundational course for dental and other health-sciences programs in the status of the educational system. The case study method was deemed a good way to focus on the objectives of this research because the theme was dentistry students' perceptions and experiences dealing with the opportunities and difficulties that the COVID-19 pandemic brought with it in this circumstance. 11 purposively sampled dentistry students served as the participants of the study. Data were gathered through an online platform with open-ended questions which were thematically analyzed afterward. The identified opportunities were lumped into ROTE: Research works, Open and independent learning, Technology for education, and Education for health. Challenges encountered were grouped as DARE: Demand for technology, Acquisition of knowledge, Remote learning, and Environmental condition for studying. It is worth noting that the participants were enlightened on the academic and personal benefits of biochemistry online distance learning. The researchers appeal to future researchers and policymakers to anchor forthcoming steps to further augment the online teaching and learning experiences of teachers and learners.

Keywords: Biochemistry, online distance learning, COVID-19 pandemic, dentistry.

INTRODUCTION

COVID-19 Pandemic and the Educational System

Teaching and learning during the pandemic have been undeniably challenging for every stakeholder of the educational system worldwide, specifically the delivery of science courses through an online distance learning modality. It is highly evident that the COVID-19 pandemic greatly affected the entire educational system including the relevant sectors which led to a shift from traditional to distance setup. Though, university programs before the COVID-19 pandemic were increasingly delivered online because of improved digital technology, more student enrolment, and expanded accessibility of home-based computers and stable internet connections (Capra, 2011; Christensen et al., 2011; Hart, 2012).

Following public health officials' advice to maintain social distancing as a fundamental health protocol, the COVID-19 pandemic swiftly resulted in the closure of institutions, colleges, and universities (Murphy, 2020). As a result, educational institutions immediately embraced e-learning as a kind of remote education while prioritizing the resources and capacities which require huge improvements (Morgan, 2020). Babincakova and Bernard (2020) stated that educators from the basic to higher education sectors around the world faced numerous challenges to deliver classes online for the duration of the COVID-19 pandemic and lockdown. At the same time, students' study activities and university life have been disturbed by the COVID-19 pandemic, causing anxiety about when life will return to "normal" (Gamage et al., 2020). Until today, it is still arguable if the return to the traditional educational setup will be possible as schools and universities prepare for limited physical class meetings.

Existing Strengths and Weaknesses of Online Learning

Just like other learning modalities, online learning has both advantages and disadvantages. When it comes to strengths, it was determined to be effective since it offered learners flexibility and ease. Students appreciated well-structured content and included recorded films found on university websites (Muthuprasad et al., 2021). Arnaud (2019) advised that students can also perform simple experiments at home using household items or chemical reagents provided for them. Additionally, travel costs and additional expenses are reduced in online learning as students are not required to be present in schools. As a result, both teachers and students learned to have the technological skills to attend their online classes and utilize computer gadgets (Kim, 2020).

In contrast, both teachers and students in online programs were physically exhausted and missed the classroom experience (Hindocha, 2020). It also brought up the subject of the digital gap and inequities in accessing the internet, which is a problem for many kids (Muthuprasad et al., 2021). Because of inadequate facilities and the absence of emotional connection with the students, online classes are tough for teachers, particularly in hands-on subject areas (Kulal & Nayak, 2020). Besides, several students felt that the teachers in online classes could have done a better job (Khan et al., 2021). Lastly, some advantages like the flexibility of the class schedule can also be a drawback, particularly for school students who have difficulty with self-management (Attardi & Rogers, 2015; Bediang et al., 2013; Dyrbye et al., 2009; Niebuhr et al., 2014). As both the strengths and weaknesses of online learning are discussed, educational institutions still find solutions to cope with the vast negative impacts brought by the pandemic.

Online Teaching of Biochemistry and Sciences Courses

Globally, colleges and universities have relied heavily on online education to mitigate the effects of COVID-19 on education. Several distance-based degrees have included online undergraduate science courses as a standard component (Driscoll et al., 2012). Even prior to the pandemic, online teaching of lecture courses was initiated by selected schools but was still far from the realization of delivering laboratory courses in virtual or home-based modalities.

A similar shift has occurred in the medical industry, activities like online learning seminars, discussion groups, medical teleconferencing, and large group presentations are all becoming more popular (Purdy et al., 2015; Sharif et al., 2020). Furthermore, many health and allied health courses have successfully implemented online programs; however, these programs were carefully implemented over time by instructors who were properly qualified and equipped (Purdy et al., 2015; De Tantillo & Christopher, 2020; Prata-Linhares et al., 2020; Sharif et al., 2020).

Rice et al. (2009) stated at one point that both physical and life sciences rely on hands-on laboratory meetings, which are usually performed in small groups to imitate real-world laboratory conditions. Experiments are also crucial in chemistry education, while more research and understanding of the impact of practical chemistry laboratory works on students' understanding is even required (Kang & Wallace, 2005; Bretz, 2019). In the current time, virtual or online laboratory activities are integrated into the curriculum of courses that demand hands-on performance as course requirements to still deliver the required learning competencies.

The Transition from Traditional to Online Delivery of Biochemistry and Sciences Lessons

Presently, online teaching is widely employed in undergraduate education—not as a stand-alone approach, but in conjunction with the traditional methodology where teachers serve as facilitators of learning (Blissitt, 2016; Sadeghi et al., 2014). Wisanti et al. (2021) discussed that transitioning from a traditional classroom to an online classroom assisted by advanced communication technology presents teachers and students with a new challenge for brand-new teaching and learning.

Most educational institutions and educators during the pandemic are looking into a variety of teaching software and application programs for students to help them learn online (Nassoura, 2020). As a result, teachers can effectively adopt online learning by considering significant factors such as dynamic learning, enthusiasm, and response (Yengin et al., 2010). Information technology was used to teach and evaluate students, which helped to close the learning gap that arose because of the lockdown (Henderson et al., 2020).

When students are not physically present on campus, computer-generated or remote-control laboratories, and video-recorded laboratory performances are appropriate options (Zhai et al., 2012). Even though online options have largely replaced face-to-face instruction, no effort was executed to capitalize on the abundance of possibilities afforded by university life for leisure, management, socializing, community action, and others (Gamage et al., 2020). Despite the threat of COVID-19, quality education delivered by schools worldwide continues for both students and teachers. As a result of this occurrence, the modalities of offering quality education have accelerated, shifting from traditional physical engagement to online meetings (Laudato & Punzalan, 2021).

From the prevailing circumstances and problems brought by the pandemic to the educational system as highlighted by the literature, this qualitative study aimed to analyze the dentistry students' perceptions and experiences of learning biochemistry lectures and laboratory courses through online distance learning modalities amid the COVID-19 pandemic. During this current state of the education system, this undertaking is pursued to help in addressing the problems and concerns on delivering the objectives of Biochemistry as a fundamental course for dental and other health-sciences programs. Finally, this study sought to answer the research question: What are the encountered opportunities and challenges of dentistry students toward the online distance learning of biochemistry during the COVID-19 pandemic?

METHOD

Research Design

This research employed a case study approach of qualitative design. The case study approach is particularly useful when an in-depth analysis of a concern, happening, or occurrence of interest in its actual real-life situation is necessary (Crowe et al., 2011). Case studies, according to Yin (2009), can be applied to give an explanation, illustrate, or investigate issues or phenomena in their natural settings. As the topic focused on the experiences and perceptions of dental students that deal with the opportunities and challenges that the COVID-19 pandemic brought in this condition, the case study was considered a suitable approach to target the aims of this research. This case was chosen due to its distinctiveness, which is of actual concern to the researchers, rather than because it is representative of other cases.

Participants

The participants of this study involved second-year dentistry students in a private educational institution in the Philippines during the academic year 2021-2022. They were taking biochemistry lecture and laboratory classes during the conduct of the study. Such a course is a required course in their program taken online at the time. Likewise, the researchers requested the consent of the students to serve as participants in the study. There were 11 students taking biochemistry courses who expressed their participation in the study. These students were initially selected through purposive sampling by the researchers according to their ability to produce in-depth knowledge related to their perceptions and experiences of online learning. Purposeful sampling is used in qualitative research to recognize and choose knowledge-rich settings to make the most

effective use of inadequate means (Patton, 2002). Table 1 presents the demographic profile of the participants while Table 2 shows the technological tools used by the participants during online classes.

Table 1. Demographic profile of the participants

	N = 11	F	%
Sex	Male	4	36.36%
	Female	7	63.64%
Age	18	1	9.09%
	19	6	54.55%
	20	3	27.27%
	21	1	9.09%
Strand	GAS	1	9.09%
	STEM	10	90.91%

Table 2. Technological tools used by the participants during online classes

Technological Tools	N = 11	%
Tablet or iPad	3	27.27%
Laptop	10	90.91%
Audio Tools (e.g., earphones)	8	72.73%
Mobile phone	9	81.82%
Desktop	1	9.09%
Video Camera	1	9.09%

Instrument

A researcher-made questionnaire with open-ended questions related to the informants' perceptions and experiences in learning biochemistry courses were utilized in this study. The researchers reviewed relevant literature to serve as a basis for instrument development (Rodriguez, 2021) in terms of its reliability and validity. Items formulated as part of the questionnaire were pursued to answer each research question which was divided into three. The first section is constructed to secure data privacy agreements from the informants. The second section is composed of questions to describe the profile of the informants in terms of name, gender, age, college program, senior high school strand, and technological tools listed in Table 2. Lastly, the last section is composed of the following questions (1) What are the challenges that you experienced in taking biochemistry classes through distance learning? What is the most difficult in distance biochemistry learning in lecture and laboratory classes? and (2) What are the new opportunities that you experienced in taking biochemistry classes through distance learning? Since open-ended questions allow participants to provide more options and viewpoints than would be allowed with a closed-question or multiple-choice survey measure, according to Allen (2017), qualitative studies using open-ended questions allow researchers to take a holistic and thorough look at the subjects being examined.

Data Collection and Analysis

Having a background and expertise in handling science education courses and conducting relevant studies, the researchers asked for the permission of the dental students to serve as the participants in this study through a consent form. This form showed significant information about the investigation including its rationale and the benefit that it would provide to the body of knowledge for policymaking. After the participants have shown their interest in partaking in the study, they were given access to answer the questionnaire using an online platform. They were also allowed to ask for some clarifications about the questions and review their responses. After the data collection, the researchers analyzed the sets of responses from 11 participants through thematic analysis of qualitative data. Thematic analysis is a qualitative data analysis process that involves examining a data set for repeating patterns, evaluating them, and reporting them (Braun & Clarke, 2006). The responses together with their respective code/id for the confidentiality of the research were presented in tables for data analysis to analyze the codes, reasons, categories, and emerging themes. The researchers familiarize themselves with the data by reading through the transcripts and actively noticing meanings and patterns that arise across the data set before beginning the thematic analysis of the research data. The meanings and patterns found in the data were first represented by codes. After compiling the codes with supporting information, the researchers organized the codes into probable topics. The different codes were integrated, and any further themes that could be broken down into sub-themes were examined. In order to verify that each theme is distinct and has adequate evidence to support it, the researchers lastly went back and refined the themes.

RESULTS AND DISCUSSION

There are four themes (specified as ROTE) generated under the category of opportunities from the conducted thematic analyses of the participants' responses to the questionnaire as shown in Table 3. These encountered opportunities were based on how the dentistry students experienced the conduct of online biochemistry learning and were identified as research works, open and independent learning, technology for education, and education for health.

The incorporated research works were able to enhance the understanding and skills of students on how scientific methods can solve problems in the field of biochemistry. One student mentioned that the integration of research article reviews as an activity in biochemistry online distance learning helped to enhance their reading comprehension and deepened their understanding of scientific innovations, especially in the field of biochemistry. It also served as preparation for their future research requirements to finish the dentistry degree program as it developed their critical thinking skill. Goldkuhl et al. (2017) stated that including both research and workable activities in the classroom is critical to providing students with a current and appropriate education that is highly suited to their future jobs. Similarly, because research and teaching differ so much across domains, the effective incorporation of research into teaching is heavily reliant on the scientific disciplines (Brew, 2010; Durning & Jenkins, 2005; Griffiths, 2004). Students' responses related to the incorporation of research works in biochemistry learning are presented.

> *"Through our biochemistry classes, I was able to discover, examine, and understand different research articles, which I believe helped me in improving my reading comprehension and broadening my knowledge about the science field. I also learned how to manage my time and follow a schedule to be more efficient in doing my tasks for my online classes." (C7)*

> *"Most importantly, I had the opportunity to improve my analytical skills in doing article reviews and answering post-lab questions since during face-to-face classes back then, focused more on application, and it sometimes lack this kind of activities wherein we can practice academic writing that is essential in doing research papers." (C9)*

Open and independent learning was considered an opportunity for dental students to study biochemistry in a better way despite being a challenging course via distance modality. The participants agreed that the situation made them manage their time efficiently to perform well in the coursework. Khan et al. (2021) revealed in their analysis that students have a good attitude toward online classes since they have served as a channel to minimize the learning disruption caused by school closures and have helped them keep their academic

concerns and progress during the ongoing COVID-19 pandemic. Online education allows students to learn at their speed and at a time that is convenient for them which means that the demand for online education is fueled by its flexibility and accessibility (Muthuprasad et al., 2021). Though, barriers or weaknesses of online learning include the need for more discipline, academic writing abilities, and self-enthusiasm, as well as the requirement for online clients to make time dedicated to studying (Golladay et al., 2000; Serwatka, 2003). Also, other issues raised by students were a lack of enthusiasm, poor time management skills, and a lack of communication devices such as smartphones (Wisanti et al., 2021). Meaningfully, proper time management is counted as a significant aspect to cope with the intricate concepts of biochemistry learning. In relation to open and independent learning, the students had the following responses.

> *"Almost every class in biochemistry, I needed to ready myself for the quizzes." (C5)*
>
> *"I realized that I can further enhance my independent learning." (C11)*
>
> *"Distance learning allowed me to assess my existing knowledge on the topics it comprises as well as trying to adjust my focus during discussions." (C9)*

The third theme under the category of opportunities in the technology for education explains that the online distance learning of biochemistry is suitable for the utilization of various educational technology programs available online especially in the delivery of laboratory course works. Many institutions on an international scale have been shifting courses and curriculum frameworks toward online education since the early twenty-first century, by establishing systems and collaborative digital platforms to enable the instruction of students who live far away (Palloff & Pratt, 2007, 2010; Salmon, 2013; Bao, 2020). Most significantly, laboratory classes give students opportunities for peer and group interactions to learn (Dalziel & Peat, 1998; Rice et al., 2009). As advances in digital technology have made virtual classrooms and distance learning possible, meanwhile according to Regmi and Jones (2020), these innovations have significantly altered the delivery of undergraduate education; much undergraduate health science and medical programs still involve a "hands-on" component. The responses of the students related to the use of technology in education are presented.

> *"I also had the opportunity to browse through more online study materials or resources, such as crash courses and summary videos, that helps me understand lessons in biochemistry that I was not able to comprehend during lectures." (C3)*
>
> *"I got to see that there are many sources that are somehow similar to face-to-face experiments rather than the ones made digitally or with cartoons." (C1)*
>
> *"The new opportunities that I experienced are being able to adapt to the situation through online materials, understanding the laboratory experiments by watching them through online videos, and grasping the educational information through interactive presentation and teaching." (C2)*

The fourth theme identified is education for health. During the pandemic, studying biochemistry and its relation to biomolecules and viruses is highly relevant for the application of knowledge to practice. Emphasis is given to understanding biochemistry concepts, especially during the pandemic due to the demand for valuable health education. As agreed by Chaney et al. (2010), biochemistry is one of the core sciences that define the elements that make up the body and mind, how they work, and how that function is regulated to keep people healthy. Biochemistry plays a substantial role in the formation of unique new scientific methodologies by combining the key tenets of biology and chemistry and it has benefitted a variety of fields, including public health (Louis, 2020). Lastly, students' responses in connection to biochemistry as a source of health education are presented.

> *"Dietary consumption is one of the concepts/opportunities I experienced in taking this class since it has led me to re-evaluate my food consumption. Understanding different pros and cons of different biomolecules." (C4)*
>
> *"The subject is focused on relating more to a real-life situation and health-related topics. (C5)*

Table 3. Generated themes on opportunities encountered by dentistry students toward the online distance learning of biochemistry

Category	Generated Themes	Non-verbatim response with frequency	Selected Codes	Theme Description
Opportunities (ROTE)	Research works	Article review allows the students to discover, examine, and understand different research studies related to biochemistry. (3)	Reviewing research articles helps to improve reading comprehension and broaden the knowledge about the science field (C7)	Integration of article review is one way to enhance the higher-order thinking skills of the students.
			Integrating research works improve analytical skills and practice academic writing (C9)	
	Open and independent learning	Learning new techniques like time management and readiness for tasks. (3)	Opportunity to have more control of student's time with personal and academic matters (C6)	Proper time management helped the students to cope with the complex topics of biochemistry.
	Technology for education	Various interactive presentations and teaching materials are readily available. (3)	Browse online study materials and resources like crash courses and summary videos (C3)	There is a maximized use and appreciation of various educational technology that helped learners to better understand the topics.
	Education for health	Understanding the pros and cons of different biomolecules helps to evaluate the diet and educate other people. (2)	Share new knowledge about biomolecules and viruses for the benefit of others (C6)	Health education is emphasized learning biochemistry, especially during the pandemic.

Transitioning from a traditional education setup to an online distance environment also paved the way for teaching-learning challenges encountered by school communities worldwide during this pandemic. This study generated four themes defined as DARE under the category of challenges as shown in Table 4 including the demand for technology, acquisition of knowledge, remote learning, and environmental conditions for studying. Besides the mentioned opportunities, however, there are still several difficulties in handling undergraduate science courses like biochemistry. Also, it is difficult to resume classes in a secure, traditional structure, especially in medical and science practical and laboratory meetings (Anderton et al., 2021).

Demand for technology is extremely considered one of the challenges brought by online distance learning. Internet connection and availability of devices are important to think about for dental students to engage with the course work, especially when watching virtual laboratory experiment videos. In this study, most of the students utilized laptops and mobile phones to attend their online classes and accomplish their tasks. Corlatean (2020) and Muthuprasad et al. (2021) acknowledged that students and their families have been battling in less developed countries known for the digital divide and inequalities, even in poor socio-economic circumstances in several developed countries, where internet and equipment resources are scarce. Likewise, Babincakova and Bernard (2020) pointed out that students with a weaker internet connection or those compelled to use small-screen devices like mobile phones would be able to watch the video recording later when they have access to a stronger internet connection or another device. For example, students confront challenges and complications in online classrooms, such as difficulties completing assignments and attending online classes, because most students take online classes using mobile phones, which are not designed for them (Khan et al., 2021). Not only in the case of the students, but lack of internet connection was also a technology element that caused trouble for teachers as well, even though the internet is one of the most significant requirements to study in an online setting (Wisanti et al., 2021). The following is a sample of the students' responses related to the technology's demand.

> *"I think the challenges that I commonly experienced are the internet connection and the effect of what is happening in the surroundings. The most difficult in distance biochemistry learning is the internet connection because there are times that my connection is getting slower, and I was not able to understand the lesson properly." (C2)*

> *"For me, having an internet connection problem or a weak reception is the most difficult part of distance learning, as well as the lack of experience in hands-on experiments. Since we only watch the experiments through YouTube, we cannot fully familiarize ourselves with the laboratory apparatus, reagents, and other chemicals used in the experiments." (C7)*

> *"The only problem I have is my internet connection. It is often unstable around morning and night so I could not properly attend biochemistry classes. I think the lessons are kind of difficult-- not exactly difficult, I think they are just complex." (C11)*

The second theme that emerged under the category of challenges is the acquisition of knowledge. Because of their diverse learning styles, such as the lack of lab supplies for kinesthetic learners and restricted teacher engagement, some students find it difficult to learn through online classes. A student stated that there is a limited presence of the right person to ask for clarification about the biochemistry lessons. Khan et al. (2021) revealed in their study that most of their respondents revealed that online programs lack interaction with lecturers and that they lack the motivation to study because of numerous distractions at home. Along with other issues, the absence of traditional ways of direct collaboration in schools is a key worry in delivering online classes (Muthuprasad et al., 2021). Anderton et al. (2021) explained that the implications of failing to offer students some of these basic learning opportunities are expected to worsen as they progress through their science degrees. This is applicable for the students taking the dentistry program as they are required to engage in hands-on activities when taking clinical courses. Moreover, the following is a sample of the students' responses related to the student's knowledge acquisition.

> *"Biochemistry is challenging and there were times when not everyone can perform at their best so I think that group studies can be helpful or even just having a companion while studying. In the laboratory part, it is difficult to acquire practical experiences and knowledge since we are not the ones doing the experiment. Also, I think that laboratory classes in distance learning are hard because we cannot compare results with one another which makes learning fun though challenging since mostly, we interpret the same data." (C6)*

> *As for laboratory classes, in my opinion, hands-on experiments are more effective in terms of gathering or learning information rather than just observing how other people do it. (C1)*

The third theme is identified as remote learning which reveals the limitations of social interaction, collaboration, and peer teaching. Adnan and Anwar (2020) implied that students felt separated in online classes because there were few group projects, little communication, and restrictions on outdoor activities, all of which contributed to social isolation. Despite the opportunity that dental students can manage their time efficiently to accomplish the biochemistry course work, remote learning modality still contributes to students' poor academic performance. Chandra (2020) stated that isolation procedures have resulted in students and teachers being confined to their homes because of the pandemic. Due to the pandemic, it is worrying for teachers and students to reach an effective interaction in an isolated atmosphere. Most of the foregoing possibilities are hindered at best and denied at worst by online delivery in a solely asynchronous mode (Gamage et al., 2020). This means that the combinations of synchronous, asynchronous, and face-to-face class sessions are better options to continue the appropriate delivery of biochemistry and other health sciences courses. The sample of the students' responses related to remote learning are as follows:

> *"The most difficult in distance biochemistry learning in lectures is the lack of social interactions with classmates. Biochemistry is challenging and there were times that not everyone can perform at their best so I think that group studies can be helpful or even just having a companion while studying." (C6)*

> *"It is quite difficult for me to catch up immediately since I don't want to disturb my classmates." (C5)*

> *"I experienced the difficulty of understanding some complex topics. It is also hard taking lessons with no one to physically ask for help or question when I am confused with something." (C3)*

Lastly, the environmental condition for studying emerged as a theme under challenge. Some dental students raised the negative influence of the unconducive surrounding on learning biochemistry via online distance modality. This led the teachers and students in online programs to be physically exhausted and to miss the classroom experience (Hindocha, 2020). Additionally, Farooqui (2020) said that the lack of real classroom conversation and detachment from the university library are the two most significant disadvantages of online lectures. Numerous distractions at home resulted in a lack of motivation to study (Khan et al., 2021). Alternatively, the results of the study by Baczek et al. (2021) unveiled that the option to remain at home, constant access to online resources, the flexibility to study at your speed, and relaxing environments were the most often mentioned benefits of e-learning by informants. Finally, the sample of the students' responses associated with the environmental condition are as follows:

> *"I have a short attention span so even a small distraction in my study space can shift my focus from studying. The quiet and loud noise, the shouting, seeing my bed makes me sleepy, and more." (C8)*

> *"I cannot focus on the lessons during the online classes because of the situations happening in my surroundings." (C2)*

Table 4. Generated themes on challenges encountered by dentistry students toward the online distance learning of biochemistry

Category	Generated Themes	Non-verbatim response with frequency	Selected Codes	Theme Description
Challenges (DARE)	Demand of technology	Internet connection and the performance of the gadgets used as hindrances. (8)	Online laboratory and lecture classes heavily rely on the conditions of the devices and internet connection used (C3)	The existing technological tools including the internet connectivity used by the students are extremely important for them to participate actively in online learning.
			The implementation of online classes is not advisable with the current technologies in the country (C6)	
	Acquisition of knowledge	Limited knowledge and skills are acquired. (5)	Explanation of complex lectures verbally is challenging to be learned (C1)	It is a big challenge for some students to learn from online classes because of their different learning styles like the absence of lab materials for kinesthetic learners and limited teacher interaction.
			The limited presence of the right person to ask for clarification (C3)	
			There is a lack of experience in hands-on experiments (C7)	
	Remote learning	Lack of social interactions with classmates. (2)	No one to physically ask for help or question (C4)	As absent in remote learning, peer teaching can enhance the students' learning through face-to-face social interaction.
			Group studies can be helpful or even just having a companion while studying biochemistry (C6)	
	Environmental condition for studying	Negative effects of the conditions in the surroundings to studying biochemistry. (2)	The loud noise and presence of the bed are distracting for learning (C8)	A conducive environment for learning is not always present or available for each learner.

CONCLUSION AND RECOMMENDATIONS

The emergence of the COVID-19 pandemic has engendered institutions to shift to online learning including courses that demand both lecture and laboratory components such as biochemistry. While everyone has been caught off-guard by this, this study engulfs the need to gather the lived experiences of dentistry students in terms of opportunities and challenges. Opportunities perceived by the dentistry students encompass the research relevance, learning preference, integration of tools, and health connection of the biochemistry lessons delivered online. Meanwhile, the learners highlighted the challenges brought by the technological demands, gaps in knowledge acquisition, scarcity of social presence, and availability of a conducive environment at home while learning in the digital realm.

As the initial step in exploring the opportunities and challenges of dentistry students, the researchers recommend points for consideration for future researchers and policymakers. They can use the results of the study as their take-off point in promoting an improved learning environment for courses like biochemistry which requires both lecture and laboratory components. The research questions used by the researchers can be contextualized to explore teachers' lived experiences relevant to this matter. This paves the opportunity to look at the core of the study using a different lens that can reinforce the results. Also, this study can serve as the pedestal for future researchers in rolling out a quantitative study focused on online distance learning of undergraduate courses like biochemistry. These can promote triangulation of the result and proceed to even model a framework for an online distance learning course in preparation for future disruptions in the academe.

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TECHNOLOGY INTEGRATION BELIEFS AND PRACTICES OF TURKISH NOVICE EFL TEACHERS AFTER ONLINE PRACTICUM

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ABSTRACT

Although technology is a vital part of 21st-century education, teachers in English as a foreign language (EFL) contexts face challenges when using digital tools in their teaching. Studies have been conducted with in-service teachers to understand their beliefs and practices with digital learning of English. However, there is a gap in the literature about investigating the technology integration beliefs and practices of newly graduated EFL teachers who experienced online teaching practice during their pre-service education. Thus, this study aimed to investigate how novice teachers' online practicum affects their teaching with technology in face-to-face classrooms. To this end, this study adopted a qualitative case study research design and collected data through six open-ended questions from 20 Turkish novice EFL teachers who received their teaching practice and school experience courses online and conducted semi-structured interviews with 5 participants. The thematic analysis of the data showed that the participants were aware of the importance of technology use, and their online teaching practice experience helped them get familiar with teaching English with digital tools before graduating. However, the lack of resources and support in their current face-to-face teaching contexts prevented them from using technology. The findings revealed that teacher education programs should offer updated content and opportunities for creating digital material to prepare EFL teachers for the future.

Keywords: Turkish EFL teachers, novice teachers, online practicum, online teaching, technology integration.

INTRODUCTION

As technological developments and inventions keep snowballing, so do the areas where we use and benefit from technology. The integration of technology is a means to improve human life and provide easy access to things we usually could not afford. Language education is one of the areas where technology integration is encouraged to benefit from its many affordances. In English language classrooms, this integration would not only help the students improve their proficiency, motivate them for learning, address their needs and interests but also prepare them for the technology-rich world that is always changing (Celik & Aytin, 2014; Kuru Gonen, 2019). Hence, the role of information and communication technology (ICT) in facilitating students to learn English efficiently is crucial (Aslan & Zhu, 2017).

However, when looking at the research done in understanding teachers' implementation of ICT in their classrooms, it can be found that teachers face some problems (Alimyar & Lakshmi, 2021; Celik & Aytin, 2014; Nugroho & Mutiaraningrum, 2020; Silviyanti & Yusuf, 2015). These studies point to the main cause of these problems to be lack of sources in schools, support from school administration, teachers' competence, and readiness to use technology to teach English.

Investigating EFL Teachers' Experiences with Technology Integration in the Classroom

To understand teachers' competence with using technology and their readiness to adopt it in their daily practices, several studies have been conducted. In Celik and Aytin's (2014) study conducted in the Turkish EFL context, teachers felt confident about their skill sets when it comes to technology integration. However,

lack of access to digital tools and internet connection were among the limitations they had regarding their practices using technology. In another study, Hol and Aytin (2020) explored the beliefs of Turkish EFL teachers and found corroborating results from 563 participants working at various parts of Türkiye, which shared positive views about the importance, use, as well as expertise when it comes to their digital technology use in the classroom. Differences between teachers' beliefs were only visible among those who had received training related to technology use, as they showed more positive views about technology integration. This finding supports Ardic and Ciftci (2019) that language teachers who have professional development in ICT have positive impacts on their practices compared to those who do not.

Regarding the factor of language teacher training programs in relation to technology use, Asik et al. (2020) investigated the integration of technology in second language teacher education (SLTE) programs in the Turkish, Portuguese, and Polish EFL contexts, and found these programs to offer training at similar levels, and revealed some factors such as limited institutional resources, support, and qualified teacher educators to be standing between successful technology integration of teachers. Results that point to similar limitations were found among EFL teachers who are working in the Vietnamese context (Nugroho & Mutiaraningrum, 2020). Nugroho and Mutiaraningrum (2020) found that although language teachers showed competence when it comes to teaching with the technology they also revealed some hesitations regarding their practices, indicating insufficient training and limited digital sources.

Consequently, there are other studies that confirm similar findings regarding the pre-service teacher education programs EFL teachers undergo. In 2016, Uzun conducted a mixed-method study to investigate the contribution of courses in pre-service teachers' ICT knowledge and skills at English Language Teaching programs in Turkish universities. The findings revealed that the education that pre-service teachers receive in both technical and educational courses failed to facilitate their knowledge in implementing technology for pedagogic purposes, leaving them unprepared for implementing a much-needed tool in the 21st-century; technology (Uzun, 2016). Ultimately, their lack of training would also lead them to leave technology out of their classroom practices.

In addition to the received training with technology at the undergraduate level, English language teachers globally feel that support from the school administration regarding professional development, technological tools, and internet connection is needed for successful technology integration in the classroom (Alimyar & Lakshmi, 2021; Ardic & Ciftci, 2019; Hol & Aydin, 2020; Nugroho & Mutiaraningrum, 2020; Silviyanti & Yusuf, 2015). In the Indonesian context, Silviyanti and Yusuf (2015) found that out of 41 EFL teachers, 11 did not incorporate technology in their teaching due to lack of training and financial support available at their school institutions, even though they had positive perceptions when it comes to the benefits of technology integration. Their study also pointed out that despite the need for better sources, teachers remained motivated to implement technology (Silviyanti & Yusuf, 2015). Ardic and Ciftci (2019) also determined support and sources for better digital tools, internet connection and professional development opportunities as the primary needs of Turkish EFL teachers for technology integration.

So far, the research on technology integration in English language classrooms has revealed teachers who want to implement technology but have limited opportunities and support (Celik & Aytin, 2014) or the skills and training to do so at a satisfying level (Ardic & Ciftci, 2019). Unfortunately, teachers in both situations were put in a new challenging situation that came with the COVID-19 and the shift to emergency online teaching (Li, 2021). In emergency remote teaching (ERT), teachers had to take huge leaps in a short period of time to maintain their face-to-face teaching schedules online. This meant shifting their normal ways of teaching and materials they used to be delivered on fully digitalized online platforms.

Emergency Remote Teaching and English Language Teachers

In this unprecedented moment in history, students and educators were caught off guard in most parts of the world, as many students and teachers had no distance education experience before the shift in compulsory distance education (Demir & Kale, 2020). The limitations that teachers already faced before COVID-19 with technology integration intensified with ERT. An investigation of Turkish EFL teachers' views towards online instruction (OI) during COVID-19 revealed that teachers' attitudes were mostly negative, one reason being due to their incompetence with using educational technology (Civelek et al., 2021). This study also

added to the previous research about Turkish EFL teachers' inadequate training for adapting to teaching online during their education. Alimyar and Lakshmi (2021) explored the readiness of language teachers during COVID-19, and the results of the questionnaire distributed online to teachers in Afghanistan and India showed that several factors affect teachers negatively. Among these were the limited student participation, and the time-consuming material preparations for teachers without having the training to do so for successful online teaching (Alimyar & Lakshmi, 2021).

Emergency Remote Teaching and Online Practicum

Meanwhile, with schools and universities turning to ERT, so did pre-service teacher education programs. According to Anderson and Stillman (2013), one of the essential key elements of teacher education is the teaching practice opportunities, and with this experience, pre-service teachers can implement their theoretical knowledge into real-life classrooms. However, due to practicum courses becoming online, pre-service teachers were also thrown into the world of online instruction, with no formal real-life classroom experience to rely on. Thus, studies on this topic have been conducted with pre-service teachers (Elcicek, 2021; Ersin et al., 2020; Gok Colak & Efeoglu, 2020; Kosar, 2021; Sepulveda-Escobar & Morrison, 2020; Shinta and Aprilia, 2020; Varela & Desiderio, 2021; Yuksel & Uysal, 2021).

In the Chilean EFL context, a study with 27 pre-service EFL teachers experiencing an online teaching practice course partook in a mixed-method study (Sepulveda-Escobar & Morrison, 2020). Findings collected from the study showed that, although the pre-service teachers were mostly positive about what this unique experience would contribute to their professional development, factors such as the limitation of teacher-pupil interaction in virtual classes turned the situation into a challenge. As Anderson and Stillman (2013) had stated, school experience is considered to contribute a lot to pre-service teachers' education, and this study by Sepulveda-Escobar and Morrison (2020) showed that, even though the participants were able to discover and learn new technologies, the shortcomings such as lack of sufficient training with ICT and the non-existence of their education with virtual teaching ruled out the benefits of the experience.

Furthermore, in a study conducted in the USA, pre-service teachers in online teaching placements reported that although they had challenges as pre-service teachers, their supervisor teachers were in similar conditions in terms of facing problems related to distance teaching, as well as lacking technical support and skills (Varela & Desiderio, 2021). Some of the participants in this study also mentioned positive attitudes for experiencing this unique situation, similar to other participants' experiences in other studies in the literature (Sepulveda-Escobar & Morrison, 2020; Shinta & Aprilia, 2020). Shinta and Aprilia (2020) conducted a mixed-method study with EFL pre-service teachers in the Indonesian context and found that the online teaching experience provided new ideas about teaching and lesson planning. Based on the findings, the researchers suggest considering the implementation of online teaching courses as a precaution for future situations (Shinta & Aprilia, 2020).

Similar experiences were reported in the Turkish EFL context as well, where pre-service teachers experienced the two courses offered during their practicum period, School Experience and Practice Teaching, online. In studies conducted during this period, pre-service EFL teachers who participated reported benefits and challenging aspects regarding their distance teaching practice experience. Yuksel and Uysal (2021) studied the reflections of pre-service EFL teachers during a 14-weeks online practicum course. The participants shared technological problems, the lack of interaction, and classroom management, as some of the challenges of online practicum. Likewise, Gok Colak and Efeoglu (2020) also found that pre-service teachers had similar views regarding their experience during online teaching practice and reported the negative aspects of managing the students and graduating without having a face-to-face teaching experience. However, they were able to learn to create online content due to the increase in digital tools during COVID-19, as well. Additionally, Kosar (2021) explored the effect of online teaching practice on 42 pre-service teachers' preparedness to teach in the future. The participants believed that they had missed out on a crucial experience and that their online teaching practice could not replace face-to-face teaching. Moreover, they felt unprepared to start their teaching career due to a lack of confidence to be teaching face-to-face.

During this period, Ersin et al. (2020) designed an alternative to the teaching practice course where pre-service teachers could practice teaching online with their peers, who acted as students. The pre-service

teachers who participated in this course had positive feelings about online teaching, despite some issues with classroom management. However, they still preferred in-class teaching practice. Moreover, the researchers suggested adding material design and technology integration for online teaching to the practicum courses in teacher education programs.

To investigate pre-service teachers' levels of technology integration during this compulsory distance teaching in Turkiye, Elcicek (2021) utilized a mixed-method research design with 414 pre-service teachers, 23 of them from an English Language Teaching (ELT) department at a public university. The findings revealed that the pre-service teachers reported high levels of technology integration, saying that distance education has helped them develop their digital literacy levels by increasing the time they were engaging with technology. It is also reported that through the shift from paper and pencil to the digitalization of their homework and project designs, the process also increased the pre-service teachers' abilities to prepare online teaching materials. Moreover, due to the high interest in technology shown by the participants in this study, pre-service teachers reported confidence within teaching via technology.

PURPOSE OF THE STUDY

Numerous studies have shown that EFL teachers generally have positive attitudes when it comes to integrating technology in English classrooms and report technology as an important tool that can motivate learners, increase participation, and provide exposure to the target language (Nugroho & Mutiaraningrum, 2020). However, some barriers hold teachers from applying their beliefs in their practices, such as lack of professional training (Nugroho & Mutiaraningrum, 2020) and limited access to resources and tools (Celik & Aytin, 2014).

Research on pre-service teacher education programs in terms of training with using ICT has been found insufficient (Asik et al., 2020; Merc, 2015; Uzun, 2016) and creating opportunities for pre-service teachers to practice their theoretical knowledge through practice has been suggested (Asik et al., 2020; Uzun, 2016; Voogt & Mckenny, 2017). Keeping these in mind, pre-service teachers who experienced an online teaching practice course during ERT were placed in a situation where they had to implement technology into their practices with no prior experience regarding online instruction or in-class teaching experience.

Thus, it is important to investigate the technology integration beliefs and practices of newly graduated EFL teachers who had an online teaching practice experience and were thrown into the online teaching world before any face-to-face teaching experience. Therefore, it is noteworthy to see whether having online school experience and teaching practice courses influences their integration of technology in their current face-to-face classrooms after they have graduated and become novice teachers. After all, there are studies that suggest that adding online teaching and material design for online instruction courses would be beneficial. As there have not been studies on the technology integration practices and beliefs of novice teachers who had online practicum courses rather than face-to-face ones, the current study asks the following research questions to fill this gap and find out if the online teaching experience was able to provide the practice pre-service teachers need for fostering their ICT use:

1. What are the beliefs and practices of newly graduated Turkish EFL teachers about digital learning of English?
2. How do they feel about the ICT education they have received affecting their current classroom practices using technology as novice teachers?
3. How does their online teaching practice experience affect their current ICT use in the classroom?

METHOD

Participants

Twenty Turkish EFL teachers, selected through convenient sampling, participated in the current study, named P1-P20. They had all graduated in the 2020-2021 academic year and experienced the final year of their teacher training programs online due to the pandemic outbreak. According to Farrell (2009), novice teachers are those who have just completed their training as teachers and are in their first year of learning

to teach in an educational setting. Thus, the participants were all novice teachers who graduated from state universities located in the Central Anatolian and Marmara regions of Turkiye and were in the first year of their teaching careers. They had received the same courses, following the curricula designed by the Council of Higher Education.

Regarding information and communication technologies (ICT), all participants completed the two courses named "Computer" and "Instructional Technologies and material design in ELT" during the four-year-long teacher education program. These courses include both theoretical and practical knowledge about tools used in ICTs and how to use them in teaching English.

In terms of practicum, two courses named "School Experience" and "Teaching Practice" in ELT were completed by all participants during their final year. These courses include opportunities for pre-service teachers to observe the teaching activities at their practice schools and practice teaching weekly by preparing and applying their lesson and activity plans (YOK, 2007). Due to ERT, teachers completed these courses online and joined online lessons at the partnering schools to observe the online classroom environment and practice teaching online to achieve the requirements of these courses.

Research Design and Instruments

This study adopted a qualitative case study design, which is used to explore a phenomenon through participants' interpretations of their experiences (Merriam, 2009). This research design was chosen to gain deeper insight into the experiences and beliefs of newly graduated teachers with technology integration after completing an online practicum. Regarding data triangulation, two different instruments, a form with six open-ended questions for written reflection and semi-structured interviews, were used. Obtaining written answers to open-ended questions collects in-depth responses from participants based on what they want to share about their experiences (Nunan, 1992; Onwuegbuzie et al., 2010). Furthermore, semi-structured interviews were preferred over other types of interviewing techniques because of their flexibility and shape around the participants' responses to the questions, therefore, providing opportunities for new ideas and questions when interviewing novice teachers about their experiences (Harding, 2018; Nunan, 1992).

The list of open-ended questions written in English was shared in the format of an online form. The first four questions were related to the investigation of the first research question, which were designed and used in the study of Nugroho and Mutiaraningrum (2020). These questions aimed to investigate the beliefs and practices of newly graduated teachers after completing an online teaching practice course to explore whether this experience affects their beliefs and practices about digital learning of English.

The fifth question, designed by and used in Celik and Aytın's (2014) study, was used to shed light on the second research question by inquiring about participants' perspectives on the related courses they were offered about ICT. The last question was added by the researcher to understand the effect online practicum has on the participants regarding their current technology integration and to answer the third research question. Expert opinion on the final version of the open-ended questions was taken from a Ph.D. holder in ELT who worked at the department of one of the universities the participants graduated. Furthermore, as all participants except P8 responded to the final question, the number of participants who were eligible when analyzing this question was 19. Lastly, the online form also inquired the participants about whether they would be interested in taking part in a semi-structured interview with the researcher.

Data Collection and Analysis

The online form with the written reflection questions was shared through messaging application groups that the participants were using to communicate with their old classmates to start the first stage of the data collection process. The process of receiving answers from participants took four weeks. After reviewing all the responses and experiences shared by participants and considering their willingness to participate in the semi-structured interview, five participants (P2, P3, P5, P10, and P11) were contacted based on the unique experiences and disagreements they mentioned in their responses compared to other participants when reflecting on their current teaching experiences at their schools with technology, challenges they faced, and lessons they learned from the previous online practicum courses they completed.

The semi-structured interviews were conducted individually with each participant over the previously used messaging application through voice messages for the convenience of later transcribing these recordings and due to the need to conduct the interviews online. The interviews were carried out in English, and each one lasted around two to three hours. Then, voice messages were transcribed and double-checked by the researcher.

The data from written reflections and the transcriptions of semi-structured interviews were analyzed and compared to determine the main themes of the study using the thematic analysis model (Braun & Clarke, 2006). To accomplish this, the researcher first coded the data from the instruments and categorized them into sub-themes based on similarities to establish the main themes. Then, these themes were placed under four titles as novice EFL teachers' technology integration beliefs and practices, their challenges and needs, their thoughts about the education they received on technological instruction, and their online experiences of the school experience and teaching practice courses. The final themes were compared with the analysis of an independent researcher who was a PhD candidate in ELT who had experience in thematic analysis and qualitative research. Using Miles and Huberman's (1994) formula for calculating intercoder reliability, an 83% agreement was found between coders, which is regarded as a considering agreement according to Hallgren (2012).

The results from the data analysis of written open-ended questions and semi-structured interviews are presented according to the themes which emerged from the collected data. The quotes that represent the themes are also presented to support these findings. Participants' quotations from written responses are named "WR", and "Int" for semi-structured interviews.

FINDINGS

Novice EFL Teachers' Technology Integration Beliefs and Practices

To answer the first research question, "What are the beliefs and practices of newly graduated Turkish ELT teachers about digital learning of English?", the participants were asked to write their responses, by reflecting on their experiences with technology, to the first two questions.
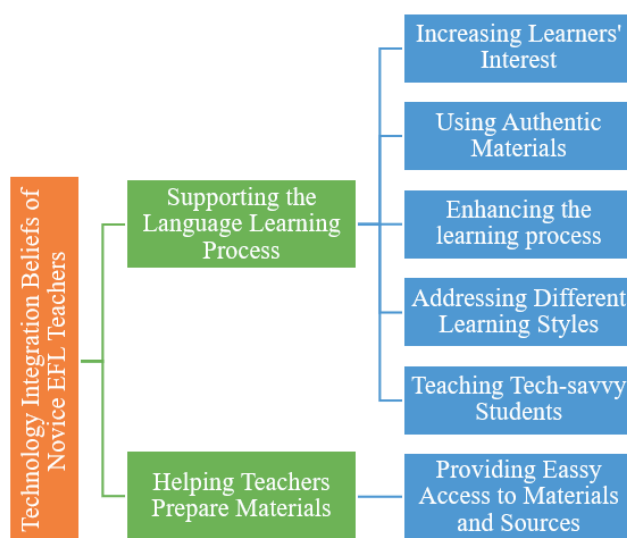
Figure 1. Technology Integration Beliefs of Novice EFL Teachers

In response to the first question, "in your beliefs, what is the importance of digital technology in English language classroom?", participants shared that technology is an essential part of today's world and the English classroom. Among their responses, two themes emerged: supporting the language learning process, and helping teachers prepare materials. These themes, along with their subcategories are presented in Figure 1 above.

Regarding the theme of supporting the language learning process, novice teachers shared viewing technology as a crucial part of their lessons that makes them more interesting and increases engagement, as seen from P20's written response, *"it is quite important both for interaction and the engagement of the students."* (P20, WR) and P6's below:

> *I think the integration of digital technology into the English language classroom is quite important because it is inspiring to both learners and teachers in terms of finding new information and interesting materials. Also, most of the online materials are designed to be interactive. Therefore, learners become a part of the lesson thanks to digital technology. (P6, WR)*

Additionally, under this theme, using authentic materials was another common belief participants shared regarding technology integration to provide language exposure, to enhance students' learning and the classroom environment. This is seen in P2's response, *"for me, in English classrooms, teachers should keep the students in the context of English with the maximum of visuals and authentic materials such as movies, etc. If not, they easily lose their interest."* (P2, WR), and in P3's interview answer:

> *You can use technology to expose yourself to native people speaking English, with authentic materials. In that sense, technology provides all the things our students need to learn English, and as teachers, we need to use it. I do not think that without technology, language learning would be beneficial. It would be too limited, and students would not learn properly. (P3, Int)*

Following teachers' beliefs, addressing different learner styles was another recurring theme, as most participants believed that technology use is beneficial for presenting materials suitable for different learning styles (e.g., visual, auditory). Two participants explained this in their answers, according to P10, *"when you use technology in the classroom, you can reach more than one student. So, not using technology means you can easily lose some of the students' attention in your lesson."* (P10, Int).

> *The contribution of technology in an English language classroom is enormous. Especially since we have access to more tools in language teaching, it is much easier to teach lessons that appeal to all senses and learning styles. I think that language teaching has become more efficient with these opportunities. (P11, WR)*

Besides these, another subcategory was teaching tech-savvy students. The participants believed that, as learners of today are born in the digital era, they are used to interacting with technology, which is why it is important to integrate it in the English classroom as well.

> *When we consider today's conditions, the focus of new generation students can disperse very quickly. One of the most important reasons for this is that they were born in the age of the internet/technology, so we should integrate digital technology in our new education models in a way that they can best understand. In this way, we will prepare more interesting environments for them. (P9, WR)*
>
> *We live in a modern world, so technology has a big role in our lives. Students are familiar with it, and this helps us to make our lessons enjoyable. Students not only learn the language but also learn how to use it in their daily language. (P7, WR)*

Lastly, participants believed technology to be a helping source when it comes to preparing and adapting materials and providing easy access to various online sources, as told by P18 in his response: *"digital technology enables us, teachers, to adapt classroom activities and materials and enhances the language learning process."* and by P2:

> *I think with the existence of smartboards, it is easier and at the same time inevitable to use the technology in our classrooms. We even open the online versions of the course books used and teach our lessons with them. (P2, WR)*

To investigate novice EFL teachers' practices with technology, the participants were asked about how they integrated digital technology in their classrooms in the second reflection question. From here as presented in Figure 2 below, four main themes emerged: presenting materials, online platforms, increasing learner engagement, and preparing and adopting materials.
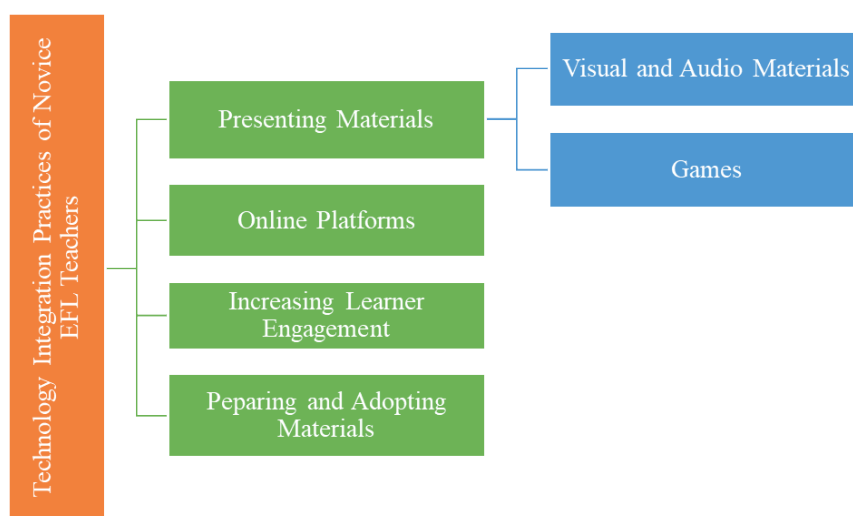
Figure 2. Technology Integration Practices of Novice EFL Teachers

First, as all teachers believed in the importance of technology integration, participants reported using it to present materials through the Smartboard in the classroom, to show visual and audio materials (e.g., the e-book version of the coursebook, movies, cartoons, online museums), and to play games (e.g., Kahoot, Quizlet, Kidzwonder). Online platforms were also used in novice teachers' practices when assigning homework, sharing materials, and checking student progress. P17 wrote: *"well, I usually prepare materials via digital technology tools. Additionally, I consider it very useful when it comes to gamification. Because of this reason, I use them to prepare games, activities, or tasks for my students."* (P17, WR).

> *I use online versions of the books that we use in the classroom. I open the digital books on the smartboard so that learners can follow easily, listen to tracks and watch videos related to our topic. Also, I assign online games and readers that I can check their progress and answers. With learners, we visit online museums and make research on the things we see in that museum. (P6, Int)*

In addition to presenting materials, teachers shared using technology in their practices to prepare and adopt regular materials into online teaching materials.

> *For my context, I make use of online tools such as Kahoot, Quizlet, Padlet, Kidzwonder, Google Classroom, and many others by creating activities using them, and creating students a chance to access materials that are gamified to engage them with my teachings. (P18, WR)*

Lastly, teachers integrated technology to increase the overall student engagement and participation in the subject, as explained in the participant's quote below:

> *I created each class a separate Padlet blog where they write in English. Even though the students were against using Padlet in the beginning, in a few weeks they started to ask me, "when are we getting a Padlet homework, or using the internet again?", and "it was different, we never did that before" kind of questions. (P10, Int)*

Novice EFL Teachers' Confidence Levels, Challenges and Needs for Technology Integration

In the third question, when asked about their confidence levels regarding teaching English using digital technology, most of the participants shared feeling confident about using technology, because of their familiarity with technology and efforts to keep up to date with new digital tools. Two participants, P6 and P11 wrote in their responses, and according to P6, *"I feel quite confident about using digital technology. It's because I've got familiar with technology use during my online practicum."* (P6, WR) and P11 wrote, *"I'm confident about technology. I am constantly trying to improve myself in this regard."* (P11, WR).

This question further investigated the challenges of novice teachers by inquiring them of the limitations they face when using technology in the classroom. As seen in Figure 3 below, three recurring themes emerged: limited technological sources, classroom management, and student profile.
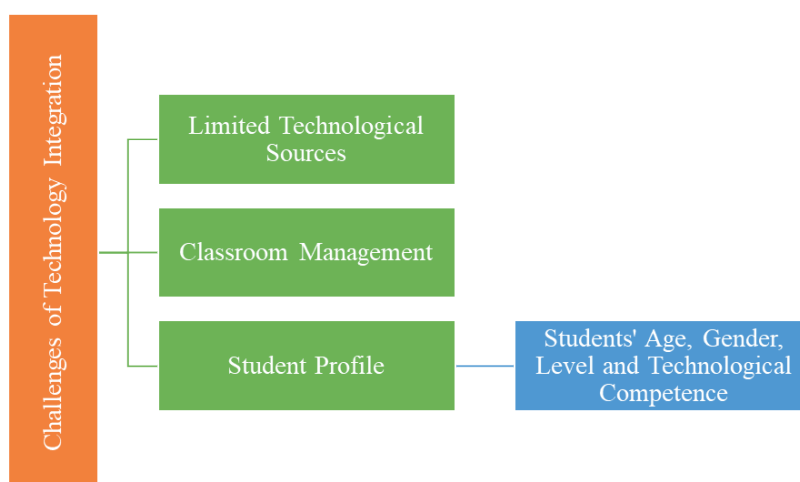
Figure 3. Challenges of Technology Integration

Among these themes, limited technological sources (e.g., internet connection, slow/old equipment, or lack of it) were mentioned, as shared by P6, *"the only challenge that I face is the Internet connection problem. If I arrange my lesson according to digital platforms, it becomes a big obstacle for me to continue my lesson."* (P6, WR) and P11, *"the only problem I encounter with technology is that the technology resources provided by the place I work at are old and in poor condition"* (P11, WR).

Following this, another theme was classroom management when using technology in the classroom, such as activating the device taking too much time and causing students to get distracted or lose interest altogether. The following extracts from P10 and P2 explain this issue.

> *At the school I work at, classrooms do not have smartboards. But I use my laptop. One of the issues with using my laptop is that since it has a small screen, students at the back cannot see the screen and were uninterested, as they could not see or hear properly from the back. I would move their seats to the front of the classroom, but they do not like this as well. (P10, Int)*
>
> *When you try to open materials on the smartboards, it can be time-consuming. Plus, if something happens to the internet connection, your entire lesson may be ruined and you must always have a B plan for the class since, with the technology, nothing is stable. (P2, WR)*

Regarding the theme of student profile, some of the novice teachers shared that using technology in their lessons can be challenging for them, due to students' ages and behaviors. P3 shared their experience in this quote: *"I struggle when students get too excited and answer the questions loudly and randomly. Some students miss their turns, and they may not understand the correct answer due to this noise."* (P3, WR), and P2 shared the following:

In one of my classes, the students hacked my link in the bookmarks for opening the online version of their book. At that time, I did not understand what was going on and thought the webpage of the publisher was down, but later I realized that they did it on purpose. (P2, Int)

In line with what P2 mentioned, P10 shared in her semi-structured interview session that when using technology, students' technological competence can be intimidating.

The reason I felt nervous when using technology sometimes is that I knew the students were more capable of using technology than me, and I would not like to miss something since the students can be quirky and can say "teacher you don't know this". I am not scared of not knowing, but some students are difficult to handle, and I don't want to give them something they could use against me. When it comes to technological trends, when you do not know something, students can mock you. I have seen it happen a lot to others. Thankfully I use Instagram so they could not mock me too much. (P10, Int)

Lastly, another challenge related to student profile was preparing digital instructional materials according to different age groups and gender, as seen in the quotes of P10, *"it was easier to create materials for an all-girls classroom [during online teaching practice]. Creating materials for both girls and boys that would suit them is more challenging."* (P10, Int), and P5, *"with young learners, once they do not like your material, then you are done with that, as they will never want to participate and get involved in that activity."* (P5, Int).

To better understand the needs of novice EFL teachers, the fourth question, "what support (e.g., school curriculum, professional development, and authorities) do you need to improve the efficacy of your technology-based teaching?" was asked. The recurring themes, shown in Figure 4 below, were curriculum support, professional development courses, and equipment and materials.
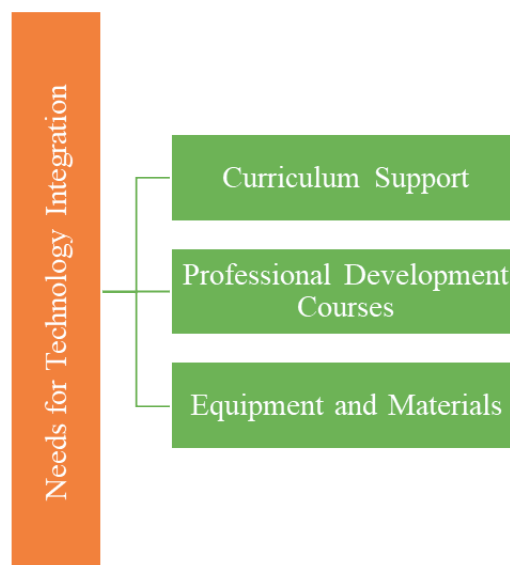
Figure 4. Needs for Technology Integration

Novice EFL teachers shared that curriculum support is needed to integrate technology at satisfactory levels and for guiding EFL teachers. P4 wrote that, *"I need to learn about more technology-based teaching and apply more of it to my classroom. However, I do not think I have enough sources and an appropriate curriculum to apply technology-based teaching in my classes."* (P4, WR).

I would like to have curriculum support since I must think about all the elements such as what I am going to use, what I am going to show them and what can be more beneficial and attractive for students for all my classes. So, it is a bit frustrating. I would appreciate more help from the lesson plans and authorities beforehand. (P2, WR)

In addition to this, the need for professional training programs to be available to EFL teachers was mentioned by participants, as seen in the extract from P19's response, *"I think authorities can give detailed training about how to use digital technology in classes, and they can provide examples."* (P19, WR).

Lastly, under the theme of funding from authorities, most participants reported the need for equipment and materials in their classrooms for technology integration. The following answers form P11, *"school curricula are generally not built on the use of technology. Even if they are, the teachers are limited by poor-quality tools and materials."* (P11, WR), and P3, *"I find a lot of materials online; however, they are all for sale, which I cannot afford to buy. So, authorities can provide English language teachers with free digital materials."* (P3, Int) explain this need.

Novice EFL Teachers' Views about Their ICT Training

The participant's responses to the fifth question, which aimed to investigate novice teachers' feelings about the training they received during their pre-service teacher education program, revealed that participants believed that the training was not sufficient to prepare them for teaching English in the 21st-century.

Reasons novice teachers listed for finding their instructional courses about technology integration as insufficient were its (outdated) content and short duration. Moreover, the participants shared that more practice was needed not only in terms of technology integration but also with classroom management issues when using technology, as seen from the following quotes of P19, *"thanks to the material design course, we explored several websites. However, that part of the course wasn't enough to become knowledgeable about educational, digital technology."* (P19, WR), and P10:

> We are living in the technological era right now. So, while getting our education as pre-service teachers at universities, we should have technology integration into language teaching courses for at least two semesters. I believe taking it for one semester is not enough. (P10, Int)

In response to the second segment of this question, which asked participants about the availability of technology integration training programs, participants shared that training opportunities are unavailable, or they are not aware of available training courses. P14 wrote: *"I only had a course in my first year at university, so there is nothing much to say about my training, and I do not think there are enough training opportunities accessible to excel in the field."* (P14, WR).

In contrast, P6, and some others wrote that face-to-face or online training opportunities for knowledge about technology integration are accessible and sufficient. P6 wrote: *"I followed many online training seminars about how to integrate technology in lessons. They were accessible for free and presented by instructors or curriculum designers working under Cambridge or Oxford University Press. I feel that they are quite sufficient."* (P6, WR).

Novice EFL Teachers' Views about their Online Practicum

Another critical factor in these novice EFL teachers' teaching experience is that they all had to conduct their school experience and teaching practice courses online -due to the global pandemic- and had to use digital tools to teach English. Therefore, the third research question explored whether this experience influences their teaching with technology in their current face-to-face teaching contexts. To this end, the impact of online teaching practice on their technology integration levels was inquired in the last question, to which participants responded by mentioning some benefits and challenges.

Based on their responses, what participants mentioned their online teaching practice was its benefits, as it challenged their skills in preparing digital materials, finding, and selecting which materials to use, and having the opportunity to practice what they learned in theory. P6 explained their experience like this: *"I had to find online and beneficial materials for my practicum. Now I know how to look for what I need on the Internet. I immediately realize whether what I've found is beneficial for my students."* (P6, WR).

> *I think I can find what I'd like to use in my lessons easily, as I know more about the sources, thanks to my online practicum. For example, for doing tests, I use a website that I used during my practicum last year. (P12, WR)*

In addition to these, another benefit of online teaching practice shared by P9 and P11 was that this experience made it possible to switch to online education when the need arises. P11 shared: *"I had the opportunity to develop myself more in the use of technology. Even if there is a situation like online education again, at least I have knowledge and experience in this subject."* (P11, WR).

> *Doing my internship online really helped me integrate technology into my lessons well. In this way, I was able to develop many nice activities/games. At the school where I am currently working, a class continued its education online for two weeks due to quarantine, so I taught online with them. And our lesson was more fun than usual. (P9, WR)*

Lastly, all the interviewees thought online teaching practice as part of their instructional technologies and material design course would be beneficial for future teacher education programs, as explained by participants P10: *"I think they should teach the pre-service teachers how to teach English lessons online. I think we will need online teaching in the future even more than now. They could split the practicum as online and face-to-face."* (P10, Int), and P2:

> *I think online practicum courses should be added to the ELT departments because if we did not have the online practicum, we would be lacking something as well. Both [online and face-to-face practicum] is a must in teaching because we cannot predict what will happen in the future, so we need to experience the online practicum, too. (P2, Int)*

Regarding the challenges with the online teaching practice and novice teachers' current technology integration, most shared that transitioning from online teaching to in-person teaching is more demanding due to classroom management and the absence of technological devices available at their schools.

> *Well, there are different applications in schools to open the smartboards and to use an online version of a coursebook within the smartboard. In my first week, it took some time to figure the whole situation out while trying to manage the class. Thankfully, I somehow coped with it. (P14, WR)*

In addition to these challenges, P2 shared in the interview session that technology integration in the classroom can be riskier, as using the smartboard in front of the classroom does not give the teacher any privacy and can lead to students' distraction.

> *In terms of privacy issues, students can see everything you open, and once you turn your back to the student they can start talking or getting lost in other things immediately. So, it is a risk in the face-to-face classroom. But when you are ready with everything you need on your personal computer and internet connection, it is safer and easier, which makes the lesson flow more smoothly. (P2, Int)*

DISCUSSIONS AND CONCLUSION

The present study aimed to understand the beliefs and practices of Turkish novice EFL teachers with online school and teaching practice experience. Regarding the first research question, the results of the open-ended questions and the semi-structured interviews revealed that all novice teachers believe in the crucial place of technology integration when it comes to learning and teaching a foreign language. This finding is in line with other studies in the literature conducted with in-service teachers (Celik & Aytin, 2014; Nugroho & Mutiaraningrum, 2020). Although teachers believe in implementing digital technologies for learning English and using them to increase students' interest and engagement, their main limitation is the poor condition of technological devices or lack thereof in their current classrooms. This finding is not unexpected

and is a reality in schools not only in Turkiye but also in other countries where technology is not available in every classroom (Chung, 2014; Celik & Aytin, 2014; Hol & Aydin, 2020; Prasojo, et al, 2018; Shinta, & Aprilia, 2020).

In addition to the absence of technological tools, the findings revealed that EFL teachers need better curriculum adjustments that offer a diverse variety of digital components and more opportunities for technology integration. This finding coincides with Celik & Aytin's (2014) study that although teachers have the skills to use digital tools, the missing equipment in their classrooms prevents them from doing so. After all, even teachers who have the best training for technology integration face boundaries due to things controlled by authorities.

Another factor that inhibits novice teachers' technology integration in their current technology use is their training with technology instruction and digital material design, which was investigated through the second research question. Although some of the participants mentioned that they benefited from the courses they received at university, they agreed with the rest of the group of novice teachers, who had graduated from both universities, on the insufficient training provided within these courses. This finding mirrors other studies conducted with pre-service teachers (Uzun, 2016) and in-service teachers. (Silviyanti & Yusuf, 2015). Moreover, the content of these courses is also found unsatisfactory in terms of offering ideas for digital tools, online platforms, and addressing different learner groups.

Another finding is how teaching tech-savvy students can both motivate and demotivate EFL teachers to use technology in their practices. As mentioned by the participants, this generation of students learns to interact with technological devices even before they enroll in primary education. However, they can use this knowledge to disrupt the lesson from progressing by playing tricks, and in the end, students' tech-savviness can lead to some teachers feeling anxious about using technology in their practices. Thus, it is apparent that to close this digital divide, in-service teachers should feel fully competent with using technology in their lessons. To this end the education they receive throughout their undergraduate studies plays an important role.

Furthermore, this study investigated the technology integration practices of EFL teachers who experienced online teaching practice, where these teachers had to conduct online lessons with digital tools. The findings derived from the results show that, although this experience prevented teachers from having an in-class teaching practice, it provided the opportunity to practice teaching with technology. This finding supports Elcicek's (2021) and Gok Colak and Efeoglu's (2020) studies with pre-service teachers in online education during the pandemic that distance education improves pre-service teachers' skills when it comes to teaching with technology. As it was also found in studies conducted before, pre-service teachers should have the practice to develop their ICT skills (Asik et al., 2020; Voogt & Mckenny, 2017). In addition to helping pre-service teachers practice technological tools, online teaching practice prepare them for cases such as ERT, during which most teachers were caught off guard. Moreover, there is always the possibility of shifting to distance education to maintain public health. Thus, preparing future teachers for teaching online is a necessity in today's world.

Besides, the finding that novice teachers improved on selecting online sources and finding quality materials for their classroom activities shows that online teaching practice had what it takes to enhance EFL teachers' skills regarding material and lesson plan design. This finding supports other studies in the literature (Elcicek, 2021; Sepulveda-Escobar & Morrison, 2020; Shinta & Aprilia, 2020). Ultimately, pre-service teachers should have the training to design digital materials for successful technology integration (Basal, 2013). Thus, the continuation of such online practices in future programs could provide pre-service teachers the chance to develop their theoretical knowledge, to gain confidence, and agency, as was also suggested by others (Elcicek, 2021; Ersin et al., 2020; Gok Colak & Efeoglu, 2020; Kosar, 2021; Shinta & Aprilia, 2020).

In addition to these, another finding that is important not to overlook is the classroom management abilities of novice teachers. The chances of having a classroom management experience, which is an imperative part of teacher education (Anderson & Stillman, 2013), were hindered when they had to conduct their teaching practice course online. Furthermore, classroom management was already mentioned as a challenge during online teaching practice, and pre-service teachers reported feeling unprepared to teach face-to-face (Kosar, 2021). Thus, classroom management issues when integrating technology are another challenge these teachers may encounter in their face-to-face practices. Further studies can investigate the experiences of these teachers

with classroom management concerning technology integration or in general. A comparison between novice and experienced EFL teachers can also offer a better understanding of this area.

To summarize, the present study investigated the beliefs and practices of 20 Turkish novice EFL teachers who completed online school experience and teaching practice courses. The results showed that all participants were aware of the importance of technology integration in this digitalized world. Regarding EFL teachers' current practices, their online teaching practice experience helped them get familiar with digital platforms and teaching in an online environment. However, the lack of resources in their current face-to-face teaching contexts, as well as the lack of curriculum support, prevents them from integrating technology at a satisfactory level.

Suggestions and Limitations

Considering the findings, some suggestions can be offered for pre-service teacher education programs. Firstly, in light of novice teachers' experiences with teaching tech-savvy students, teachers need to feel confident using technology. However, it is unfortunate that in this century -where humans use technology for all kinds of purposes- courses that should educate future teachers about how to use and incorporate technology for language teaching are being viewed as insufficient, outdated, and overall limited by students who completed them. As technology is an inevitable part of 21st-century language education, ELT department curricula should be revised to offer up-to-date course content, which will inform future teachers in both theoretical and practical knowledge about different trends and teaching methods; online, face-to-face, or mixed. The ICT courses they receive through the courses offered to teachers at the undergraduate level should be ready to equip future teachers with the necessary knowledge to use technology in all teaching formats. Some actions must be taken to improve the courses that target technology use, digital material design, and online teaching, such as incorporating the use of student portfolios as an assessment for pre-service teachers to showcase their skills with digital tools and the creation of online materials, and practice online learning and teaching tools and how to employ them in their teaching while doing so.

Secondly, as the role of online instruction became more permanent in the last two years, adding online teaching practice opportunities as part of pre-service education could be suggested. After all, this study shows that while having their school experience and teaching practice courses online made it impossible for pre-service teachers to experience a face-to-face classroom environment, it pushed them to practice their theoretical knowledge of technological tools, test and explore new digital tools, and gain confidence in a new area of teaching, which has now become an important part of our lives due to COVID-19. So, as a second suggestion, pre-service teachers should be provided with the opportunity to train about designing and presenting materials in an online environment. Online communities, where pre-service teachers can practice teaching online with their peers and receive feedback from peers and mentors, could be created. Incorporating opportunities for practicing online teaching materials was also suggested by Ersin et al. (2020), Kosar (2021), and Shinta and Aprilia (2020) as well.

Moreover, due to COVID-19, a new population of novice teachers who received their school experience and teaching practice courses online has been added to ELT teachers in Turkiye. As reported in Kosar' (2021) study, these teachers may not feel confident teaching in person yet. Considering the importance of classroom management not only for technology integration but also in general, the challenges of these teachers when it comes to this topic should not be overlooked. It would be a good opportunity for teacher training programs to consider including classroom observations or practices in earlier years not only to prepare them better for the real teaching environments but also to spare another generation of EFL teachers from missing out on having an in-class teaching experience in case of another global crisis.

Other suggestions can also be made for higher authorities regarding technical equipment that should be available at schools for technology integration, such as smartboards and internet connections. Based on the findings, teachers' competency when it comes to teaching with technology is of no use when these tools are unavailable. As this and other studies point to the lack of technological tools at school, authorities should acknowledge these studies and move forward in ways that will help both teachers' practices with technology and students' language learning by equipping schools with the needed tools, such as smartboards for teachers use visual and audial materials during their lessons. Therefore, teachers' voices and whether the opportunities are available to them at their schools in terms of digital tools should be considered when expecting them

to execute the curricula. Their voices, as stated earlier in this study, call for a curriculum that incorporates technology use and for sufficient tools to be made available in their classrooms.

Lastly, some limitations of the study should be acknowledged. The results are not generalizable to all novice EFL teachers, as the current study adopted a qualitative case study research design. To better understand the influence of online teaching practice on these teachers' current classroom practices, such as issues related to technology integration, further studies can investigate the experiences of these teachers concerning technology integration by comparing novice and experienced EFL teachers. Additionally, as participants with similar backgrounds were recruited, the results of this study yielded recurring themes, which could be enriched through a sample more diverse in educational contexts and size. Lastly, the data collected in this study comes from qualitative data instruments. Future studies in this area are suggested to adopt quantitative data for data triangulation and more in-depth results.

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PRESCHOOL EDUCATION AND DISTANCE EDUCATION: TEACHERS' OPINIONS ABOUT PRESENT STATUS AND FUTURE POSSIBILITIES

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ABSTRACT

Coronavirus pandemic has imposed significant innovations in all aspects of our lives which were a respond to precautional measures to avoid covid-19 spreading throughout the community. In many countries, Greece included, education shifted rapidly to a distanced form affecting this section of our lives as well. The present study attempts to investigate the intergration of distance education in preschool education in the future as well as the factors that promote or inhibit it, by examining the views of kindergarten teachers. By employing quantitative modes of enquiry and specifically a significant number of questionnaires we concluded that teachers argue about the effectiveness of distance learning. Specifically, in order for the educational community to start a meaningful conversation about the integration of distance education in preschool education, issues such as teachers' technological readiness, technological equipment and parental involvement need to be addressed.

Keywords: Distance education, preschool education, Coronavirus pandemic, kindergarten.

INTRODUCTION

The coronavirus pandemic and the necessary measures taken to circuit break its spread caused significant upheavals and adjustments both in society and economy. It has also led to major adjustments and significant innovations in education, leading most countries to suspend face to face, traditional learning, while immediate decisions have been made to introduce innovations in the educational process with the ultimate goal of continuing the education of students. In short, distance education was the most appropriate tool for continuing the educational process.

In Greece, the Ministry of Education issued a circular on the implementation of distance education in terms of Primary and Pre-school education clarifying that distance teaching is sought to keep alive the contact and the interest of students with the educational process (Greek Ministry of Education, 2020). Kindergarten teachers were requested to use digital skills to meet the modern needs of distance education, although the use of these skills in everyday teaching practice is scarce due to the lack of access to the Internet and technological and digital media, which is duly noted not only in our research but also in other recent researches (Doyumgac et al., 2021; Erkan & Sedat, 2021; Gkoros & Bratitsis, 2021; Gkoros & Papageorgiou, 2020; Fis Erumit, 2020). This phenomenon derives from the fact that most schools suffer from inadequate digital infrastructure and financial inequalities of students' families which become an unambiguous obstacle

to equal access in distance education. Generally, in pre-school education the use of ICT in the educational process presents several difficulties of implementation, which are related to the lack of administrative and logistical infrastructure of schools (Gkoros & Bratitsis, 2021; Slaouti & Barton, 2007; Butler & Sellbom, 2002; Pelgrum, 2001; Guha, 2000) and the lack of teacher training (Gkoros & Papageorgiou 2020; Dayal & Tiko, 2020).

As is widely known, daily life in kindergarten is shaped by the related curriculum that provides proper guidance for planning and developing activities that will help children to cultivate learning areas that refer to their language ability, mathematics and mathematical thinking, expression and creation, supporting technological and digital literacy (Pedagogical Insitute, 2021; 2003). Rosales (2011, as cited in Dereshiwsky et al., 2017), emphasizes that all 21st century curricula must include digital approaches, whether taught online or in person. The organization and pedagogical utilization of the digital environment of the kindergarten is an important parameter in the educational process (Pedagogical Institute, 2021) and the kindergarten teachers should constantly enrich and improve their knowledge. However, preschool education is constantly being modernized, a fact that is reflected in the new Greek curricula that is about to be implemented and in which are notably imprinted the basic abilities and skills that every student must develop in order to be able to function as an independent thinking and active citizen of the 21st century. Specifically, the new curriculum states that "modern curricula are called to equip students with the necessary skills…for their personal integration, social inclusion, active citizenship and their employability in our knowledge-based society" (Pedagogical Institute, 2021). It is further argued that the cultivation of these skills from pre-school age has significant advantages for their subsequent consolidation.

THEORITICAL FRAMEWORK

Preschool Education

Education, in its narrow meaning and as it is used today in the science of pedagogy, means the systematic and organized process of education and learning that is planned on the one hand by the state or by any other body, public or private, and on the other hand implemented by their bodies (Xochellis, 2018). Preschool education is a term used to describe the organized process of education and learning of children aged four to six that is offered to them by professionals with comprehensive scientific education, pedagogical and didactic training in the natural space of young students, the kindergarten. Preschool education attendance has become essential for children as, according to modern scientific data, preschool age is a critical and essential period for their physical, mental and social development (Vrynioti et al., 2008).

The main purpose of the preschool education is the comprehensive development of children and specifically "to help children develop physically, emotionally, mentally and socially" (Pedagogical Institute, 2003). Greek preschool education curriculum focuses on teaching and learning for all students without exception and encourages them to reflect on their learning processes and practices. Essentially it encourages them to learn how to learn. Its basic principles aim at the design of multi-level activities, the realization of realistic goals, the utilization of pre-existing knowledge, the utilization of error, the application of alternative evaluation methods and the substantial contribution of the game (Pedagogical Institute., 2003). A kindergarten teacher, therefore, is expected to form a learning environment in the classroom that is open and flexible, which will facilitate the learning effort, will encourage students and will promote the construction of personal identity and autonomy, will promote skill development such as communication, creative and critical thinking, social skills and competencies related to citizenship (Dafermou et al., 2006).

Kindergarten school life offers children daily opportunities for multifaceted experiences that help them acquire the necessary social skills through social interactions with others (Hoogsteder et al., 1999). The development of social skills allows the child to adapt smoothly to the group life of the classroom and to develop interpersonal relationships with those around him. The absence or lack of these skills can lead to isolation, school failure and dropout resulting in problems in the child's life (Asher, et al, 1992, as cited in Bosniadou, 2000). According to neuropsychology findings, social and emotional skills are essential for the integrated development of thinking and learning activities (Elias, et al. 1997). Another necessity for school success is the acquisition of motor skills and abilities and to this end, curricula that have been formulated in

Greece during the last two decades incorporate as a pedagogical approach the psychomotor education that aims at its comprehensive development of children through the improvement of motor skills and abilities (Pedagogical Institute, 2021; 2011; 2003).

In the context of conventional teaching, a dominant element of the learning process is communication which takes place on the basis of teacher-student interaction (Matsagouras, 2006; Gotovos, 1997). Essentially, communication helps to develop interpersonal relationships between team members, creates a pleasant atmosphere, enhances social learning processes and contributes to the effectiveness of learning (Bakirtzis, 2003). With the existence of proper communication, the appropriate supportive environment is formed in the classroom that aims not only at the acquisition of knowledge but also at the cultivation of basic skills and abilities that contribute to the psycho-emotional and social development of the child (Pasiardi, 2001; Charalambous, 2000).

Distance Education

In exceptional cases, such as Covid-19 coronavirus pandemic, where children do not have access to the above mentioned teaching-learning process on a daily basis, distance education is one of the most effective ways to access it. The rapid spread of the internet and social networks has changed not only the way we communicate but also the way we work and learn (Garrison, 2011; Pange & Pange, 2011; Toki & Pange, 2010; 2009; 2007; Pange, 2009) contributing significantly in shaping a sophisticated framework for the implementation of distance education and leading to a new era of learning. In the literature there are a variety of approaches and definitions for distance education and in its more general dimension the term of Distance Education is used to describe the educational activities in which the learner is at a physical distance from his / her trainer and uses some form of technology to communicate with him, accessing at the same time educational material online (Schlosser & Simonson, 2002). Thus, the learning process takes place through an organized computer network where the teacher and students interact remotely, exchanging messages and educational material (Curran, 2006; Moore & Thompson, 1997). Distance education refers to a pedagogical-teaching process where the student is trained to learn while at home without the physical presence of his teacher whereas at the same time it is possible to use flexible teaching techniques to help each student adapt the educational process to his needs, his pace of life, his level of knowledge and his personal learning style (Rowntree, 1992). Also, for its realization, a series of technological means is used, aiming not only the student's contact with the teacher but also the students' own access to the educational material (Papalambrakopoulos, 2020).

The implementatipn of distance education can take three forms, synchronous, asynchronous and blended. In synchronous distance education, participants have the capability of direct communication while the process of teaching and learning takes place simultaneously. The instructor delivers the lesson live with the support of teleconference means and the students, although in a different place, attend the lesson at the same time. This form provides flexibility and competence of student reaction and interaction time. Other features this form holds is interactive communication and sharing content. Also, feedback can be provided not only through live video and sound but also through discussion and chat forums. In asynchronous distance education the participants do not have the possibility of direct communication as the process of learning as well as the delivery or creation of a lesson takes place at any time. It's all about unrestricted electronic classes as the content is available by the teacher to certain platforms of asynchronous education that students can access at any time (Anastasiades, 2012; 2008; Moore & Kearsley, 2012). In blended form of distance education, the learning environment is shaped by the combination of synchronous and asynchronous distance education followed by traditional face to face learning, creating a collaborative learning framework (Joksimovic et al., 2015; Anastasiades, 2012).

Research data indicate that the learning process in distance education is based on communication between teacher and learner (Iliadou & Anastasiadis, 2010; Zygouris & Mavroidis, 2010). Teachers' main goal is to support, inspire, give feedback, activate students' interest and develop motivation for students' participation in daily teaching practice, but also to form a learning framework that will be based on communication (Iliadou & Anastasiadis, 2010; Papadimitriou & Lionarakis, 2011). Dereshiwsky et al. (2017) emphasize that effective distance learning follows the same models as traditional face to face teaching and that its success is established on three key factors: teacher's essential contact with the learner, academic integrity in the curriculum and the skills of organization, presentation and evaluation of curriculums' material.

In summary, distance education refers to a pedagogical-teaching process where the student is guided to learn while at home without the physical presence of his teacher. At the same time, it is possible to use flexible teaching techniques in order to help each student to adapt the educational process to his needs, to the rhythm of his life, to his level of knowledge and to his personal learning style. Furthermore, in order for distance learning to be accomplished a series of technological means is used with ultimate purpose the interaction of students and teachers but also the access to educational material.

Although in most distance education programs technological means and educational material hold a key role, in pre-school education their role is more supportive than crucial. The above view is based on the fact that the spatial distance between teacher and student creates the need for another adult to facilitate, support and supervise the learning process in order to bridge this spatial gap that is inevitably created (Downes, 2013). The role of "supervisor" and "facilitator-supporter" at home is usually taken over by one of the two parents of the child, who in most cases is his mother (Harley, 1985, as cited in Kontogeorgakou & Georgiadis, 2016). Nowadays, modern research suggests that the content of learning is not completed at school but much is done at home. Researchers believe that the participation of parents in the educational process ensures the success of preschool education programs (Manolitsis, 2004). The cooperation and communication between the school and the family seems to be necessary since they coexist in the life of the child for several years and have a decisive influence on his cognitive, physical, emotional and social development (Vrynioti et al., 2008). In distance education, spatial distance cannot be a disadvantage when the learning process is based on the principles of mutual respect, cooperation and coordinated joint effort (Xia, 2020) thus creating a different dynamic of communication with all participants (Segrin & Flora , 2019) and the conditions for a more effective cooperation between kindergarten teachers and parents. In any case, many argue that the learning process in distance education is a multifaceted educational process that is not based on the teacher-centered model of vertical knowledge transfer, but on the creation of individuals able to learn how to learn through active knowledge acquisition processes (Mouzakis, 2006).

PURPOSE OF THE STUDY

The present research was conducted during the school year 2020-2021 in Kindergartens of the Region of Epirus, Greece. Its main goal is to investigate the views of kindergarten teachers on distance education after its application due to the suspension of teaching in the context of the implementation of measures against coronavirus spread. This paper attempts to explore the views of kindergarten teachers on the integration of distance education in kindergarten in order to draw useful conclusions that will help formulate a framework for its implementation as an alternative and complementary teaching tool under normal conditions. Subsequently, the following research questions can arise:

1. How familiar were kindergarten teachers with distance education before its implementation due to the COVID 19 pandemic?
2. What is the relationship between teachers' years of service and teachers' ICT literacy?
3. Does teachers' ICT literacy affect their degree of familiarity with distance education before its compulsory application?
4. To what extent do kindergarten teachers believe that distance education can be used in pre-school education after the end of the pandemic?
5. What are the factors that, according to the teachers, can contribute to the integration or not, of distance education in pre-school education after the end of the pandemic?

METHOD

In order to explore the views of kindergarten teachers regarding the integration of Distance Education in Preschool Education, we chose the quantitative research approach to study a large number of cases and to statistically analyze research data.

Participants

A probability sample was used in our research because this is the most accurate form of sampling and in this way we can claim that our sample is representative of the population in order for the results of the survey to be generalized (Creswell, 2016). The population of our research consists of all the kindergarten teachers in the country while the target population is the total of the kindergarten teachers of the Region of Epirus, Greece. From the total of 280 kindergarten teachers we selected a random sample of participants with probability but our approach was non-systematic by selecting a percentage (30%) of the target population as a sample. The selection of a probability sample was crucial as it is the most accurate form of sampling in quantitative approaches since the selection of one person or another is a matter of pure luck (Cohen, Manion & Morrison, 2008). More specifically, the sample of our research consists of 82 Kindergarten Teachers of the Region of Epirus because 2 of 84 teachers refused to participate in the survey for personal reasons.

Data Collection and Analysis

As a data collection tool we used a web based questionnaire. In particular, the questionnaire is considered to provide the ability to collect empirical data related to the same subject from a large sample number in a short period of time (Paraskevopoulos, 1993). Other than that, web questionnaires can provide data in fast and economic way (Creswell, 2016) while measures of social distancing due to covid-19 are being followed. Our questionnaire, apart from the first part which consists of demographics, mostly adopts closed type questions on a Likert scale ("1" Not at all to "5" Absolutely) and its creation is based on our main goal and, in particular, in the abovementioned research questions, in order to guarantee the validity and reliability of the results (Cohen, Manion & Morrison, 2007). Closed-ended questions are the most appropriate means of collecting opinions, as they are easier to complete and answer and they allow collection, processing and statistical analysis of numerical data (Creswell, 2011). In addition, our questionnaire incorporates an open-ended question and four semi closed ended questions. More specifically, the first part included questions related to demographic characteristics, the extent that individual characteristics are considered determinants of shaping the attitudes and perception of individuals. Thus, there were questions concerning gender, employment relationship, years of service, educational level and familiarity with ICT. The second part concerned a group of questions that had to do: a) with the readiness and familiarity of the respondents with distance education and its conceptual content, b) their prior experience and participation in any distance education program, c) their set of preferable apps that they used during distance education due to covid. The third part had to do with the participants view about integrating distance education in pre school education in the future. The fourth and last part of the questionnaire, concerned the factors that may or may not contribute to the future integration of distabce education in pre-school education. It is also crucial to mention that a pilot test of the questionnaire was preceded the main survey in order to have some feedback about our tool and of course the pilot test participants were excluded from the main survey. Other than that, we made sure that specific steps and procedures needed to be followed were thoroughly described to the preface of our questionnaire in order to prevent errors during the completion.

The survey was conducted from May 5, 2021 to June 4, 2021 with an anonymous online questionnaire (google forms), which was requested by e-mail to be completed by 84 kindergarten teachers. The participants of the present research were informed about the fact that the questionnaires were anonymous and that the results that would result from their processing would be used for research purposes only. In the aforementioned period, 82 questionnaires were received. SPSS 21 software was used for statistical processing.

FINDINGS

Descriptive Analysis

Demograhpics

Our sample consisted of 82 participants and 96.3% of them were women, meaning that only 3,7% of them were men. Also, 55.6% of the participants had from 15 to 25 years of service and about 31% of them had more than 25 years of service.

Table 1. Participants' level of Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor	62	75,6	76,5	76,5
	Master	16	19,5	19,8	96,3
	Ph.D.	3	3,7	3,7	100,0
	Total	81	98,8	100,0	
Missing	System	1	1,2		
Total		82	100,0		

In respect of participants' level of education, about one in five participants had a master's degree (19,8) meanwhile most of them had only bachelors' degree (75,6).

Furthermore, half of the participants were familiar with basic ICT skills (Ministry of Educations' certificate: Level A) while 35.4% of the participants were familiar with enhanced ICT skills (Ministry of Educations' certificate: Level B).

Familiarity with Distance Education

Table 2. Familiarity with Distance Education

	Not at all		A little		Sufficiently		Considerably		Absolutely	
	N	%	N	%	N	%	N	%	N	%
Level of familiarity with D.E. before pandemics' mandatory implementation	37	45,1%	25	30,5%	9	11,0%	7	8,5%	4	4,9%
How familiar are you with the conceptual framework of D.E?	16	19,5%	23	28,0%	29	35,4%	7	8,5%	7	8,5%
Level of correspondence between D.E. and Greek Curriculum	17	20,7%	34	41,5%	24	29,3%	6	7,3%	1	1,2%
How familiar is the term synchronous education?	3	3,7%	9	11,0%	22	26,8%	19	23,2%	29	35,4%
How familiar is the term asynchronous education?	2	2,4%	9	11,0%	25	30,5%	18	22,0%	28	34,1%

More than three in four kindergarten teachers were a little or not at all familiar with distance education, while about 13% said they were considerably or absolutely familiar with it. Also, 17% state that they are considerably or absolutely aware of the conceptual content of distance education, while more than six out of ten kindergarten teachers believe that distance education corresponds to the basic principles governing Greek Curriculum for Pre-school education. Nevertheless, about 56-58% of the participants are considerably or absolutely familiar with the terms of synchronous and asynchronous education.

Level of Experience in The Context of Distance Education

Table 3. Level of Experience on the Context of Distance Education

	No	Yes
	%	%
Do you have any experience in participating in any program of reeducation that was conducted remotely?	56,1%	43,9%
Do you have any experience in participating in any educational program that your school conducted remotely?	76,8%	23,2%
Did you integrate Distance Education into the educational process before the pandemic?	91,5%	8,5%

More than nine out of ten teachers had not incorporated distance learning practices into the kindergarten before the pandemic. In addition, approximately 77% state that they do not have experience in implementing a distance learning program while 56% do not have any experience of participating in a training program conducted in the form of distance learning.

Distance Education Tools that were Used by Kindergarten Teachers during Distance Education

Table 4. Usage of Distance Education Tools

		Frequency	Percent	Valid Percent	Cumulative Percent
	SYNCHRONOUS	53	64,6	64,6	64,6
Valid	ASYCRHONOUS	29	35,4	35,4	100,0
	TOTAL	82	100,0	100,0	

It is obvious from table 3 that synchronous education was preferred than asynchronous in about 65% of the sample while the rest 35% chose asynchronous education. It is possible that the decision of the Greek Ministry of Education for mandatory implementation of synchronous distance education at other levels of education (elementary schools, high schools and Universities) played an important role in these results because synchronous distance education tools were available for free by the state in order to support synchronous education.

Distance Education Tools Frequencies

Table 5. Tool Usage Percentages

		Responses	Percent of Cases
		N	
Tools[a]	Webex	72	88,9%
	ZOOM	3	3,7%
	eclass	19	23,5%
	email	49	60,5%
	Schools' Blog	6	7,4%
	Schools' Website	1	1,2%
	Viber	20	24,7%
	Messenger	16	19,8%
	Skype	3	3,7%

Almost 89% of the participants stated that they used *Webex* (synchronous application-tool). The percentage is really high, but it probably has to do with the fact that this application was the one that the State offered for free usage. Only 3.7% of the participants used *zoom* (synchronous application-tool). *E-mail*, being a rather conventional tool, was used as a means of asynchronous communication by six out of ten kindergarten teachers. One in four kindergarten teachers used *online classrooms* (asynchronous application-tool). Other tools that can combine synchronous and asynchronous communication such as *Viber* application was used by one in four kindergarten teachers while one in five used Facebooks' *Messenger*.

Kindergarten Teachers' Opinions about Distance Education

Table 6. Teachers' Opinions about Distance Education

	Not at all	A little	Sufficiently	Considerably	Absolutely
	%	%	%	%	%
ICT and distance education contribute in promoting flexible learning and teaching.	13,4%	45,1%	23,2%	9,8%	8,5%
Distance education is only appropriate when physical presence of both teachers and students isn't possible and therefore traditional face to face teaching and learning isn't possible as well.	4,9%	14,6%	29,3%	26,8%	24,4%
Distance education ensures that students with disabilities have equal access in the educational process.	17,1%	26,8%	25,6%	15,9%	14,6%
Distance education promotes blended learning supporting conventional teaching	19,5%	25,6%	29,3%	17,1%	8,5%
ICt and distance education promotes the development of computer literacy of students in pre-school age.	8,5%	17,1%	43,9%	15,9%	14,6%
New teaching approaches and tools of distance education cultivate students' critical thinking.	14,6%	29,3%	31,7%	12,2%	12,2%
Distance education is highly contributive in development of cooperation and communication between teachers and parents	14,6%	23,2%	36,6%	13,4%	12,2%
Distance education could be a solution in circumstances when students can't attend in school	13,4%	24,4%	20,7%	18,3%	23,2%
Integration of synchronous and asynchronous learning contributes in development of students' computer literacy.	14,6%	30,5%	29,3%	8,5%	17,1%
Most of asynchronous distance learning tools contribute in students' learning by enabling individual learning pace.	19,5%	25,6%	25,6%	15,9%	13,4%
During distance education students with disabilities are more involved in educational process than in conventional education	24,4%	34,2%	26,8%	6,1%	8,5%
Distance education promotes individualized learning of students.	31,7%	28,0%	25,6%	6,1%	8,5%
Distance education motivates students' interest and participation.	13,4%	39,0%	25,6%	11,0%	11,0%
There are significant problems in digital infrastructure of schools.	0,0%	11,0%	23,2%	32,9%	32,9%
There is inadequate access to internet and technological/digital means for both students and teachers	1,2%	6,1%	19,5%	32,9%	40,2%
There is difficulty of autonomous use of technological means by preschool age students	1,2%	3,7%	17,1%	32,9%	45,1%
Distance education is less effective than conventional education in developing students' social skills	6,1%	1,2%	6,1%	23,2%	63,4%
Distance Education limits the implementation of psychomotor activities	0,0%	0,0%	7,3%	22,0%	70,7%
Distance Education in Kindergarten makes it necessary for an adult to be present as a supervisor.	0,0%	3,7%	6,1%	20,7%	69,5%

Kindergarten teachers' views on the need to integrate distance education into kindergarten are mostly negative. About 90% of them state that the implementation of distance education reduces on the one hand the implementation of psychomotor activities while the presence of an adult as a supervisor becomes necessary. Other than that, 86% of kindergarten teacher state that distance education is less effective than conventional education in developing students' social skills. Additionally, 78% of them state that preschool students face difficulties in using independently technological tools of distance education. Also, 73% of the participants, state that internet and technological means accessibility for both teachers and students is limited, while over 65% of them state that there is a severe problem regarding the digital infrastructure of schools. More than half of the kindergarten teachers believe that distance education activates a little or not at all, interest and participation of students, while 22% believe that interest and participation is activated considerably to absolutely during the implementation of distance education. Furthermore, hardly 15% of the participants believe that distance education promotes considerably individualized learning, while 60% of them believe that individualized learning is promoted a little or not at all. As for the involvement of students with disabilities during distance education, participants consider that is almost non-existent in 58% while one on four considers that their involvement is just sufficient. In addition, 44% of them believe that distance education provides a little or not at all equal access in the educational process to children with disabilities while 30.5% supports the opposite.

Asynchronous distance learning tools' contribution to individual learning pace is considered from considerably to an absolutely degree positive for the 29% of the participants, however 46% of them consider the above mentioned contribution to be either small or non-existent. Unexpectedly, in our opinion, 45% of kindergarten teachers consider the effect of distance education on students' computer literacy to be small or not-existent with only 25.6% of them accepting its' contribution to a considerably or absolutely degree.

The percentage of participants who state that distance education could be a solution in cases where students can't attend in school (41.5%) it's considered low as well. Regarding the contribution of distance education in the development of cooperation and communication between teachers and parents, 37.8% consider that there is a little or not at all contribution in that direction while 25.6% consider it to be considerably or absolutely existent. Cultivation of students' critical thinking using tools of distance education seems to take place to a little extent or not at all according to 44% of the kindergarten teachers while only 24.4% state the opposite. As for teachers opinions about blended learning, one in four of them believe that distance education promotes it, while 45% believe that distance education has little or not at all effect on promoting blended learning.

Where positive attitude seems to prevail is the promotion of the development of digital skills despite the fact that only 30.5% agree absolutely, compared to 25.6% who agree a little or not at all. However, 44% believe that digital skills are being developed even sufficiently. Also, distance education is slightly accepted at a rate of 45% regarding its contribution to promoting flexible learning and teaching.

In general, it seems that distance education, according to participants, is only a deliberate choice in case of emergency when physical presence of both students and teachers is not possible (50%). In conclusion, kindergarten teachers do not seem to appreciate the implementation of distance education in relation to preschool children. Early age, or existing infrastructure, and limited access to internet and supportive means such us computers, tablets etc. seem to be key constraints on accepting distance education. Even blended learning is treated with hesitation while it seems, but again not strongly, the application of distance education is accepted only in cases where it is not possible for students to attend school.

Comparative Analysis

Does Teachers' ICT Literacy Affect Their Degree of Familiarity with Distance Education Before Its Compulsory Application?

Variable 1: Degree of familiarity with distance education before its compulsory application (Ordinance variable, 1=not at all, 5= Absolutely)

Variable 2: Familiarity with ICT. (Categorical variable, 0: without certification, 1: A level, 2: B level).

Interpretive variable: Familiarity with ICT. (Certificate holder)

Dependent variable: Degree of familiarity with distance education

A non-parametric check was applied because in such distributions normality isn't proven. Since the interpretive variable has more than two levels Kruskal-Wallis non-parametric check was applied (corresponding non-parametric check of the ANOVA parametric test, α = 0.05).

Table 7. Non parametric Check. Degree of Familiarity/ICT Certificate Holder

Total N	82
Test Statistic	7,001[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	0,030
a. The test statistic is adjusted for ties.	

There is a statistically significant difference between kindergarten teachers with different level of possession, or not, of certificate on ICT regarding the declared level of familiarity they had in distance education before the start of the pandemic (KW (82) = 7.001, p-value = 0, 03). Table six didn't provide information on where the difference lies. Therefore multiple comparison testing was carried out.

Table 8. Multiple Comparisons. Level of Familiarity with ICT/ICT Certificate Possession

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
None certificate- A level Certificate	-14,671	7,324	-2,003	0,045	0,135
None certificate- B level certificate	-20,259	7,659	-2,645	0,008	0,025
A level certificate – B level C -5,588		5,414	-1,032	0,302	0,906

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

According to Table 7, the difference, which made the test indicate statistical significance, lies between those who do not have any of the listed certificates and those who have a level B certificate. Specifically, level B certificate holders reported higher levels of familiarity with distance education before its mandatory application compared to those who did not hold any of the mentioned certificates (Test statistic = -20,259, p-value = 0.025).

What is the Relationship Between Teachers' Years of Service and Teachers' ICT Literacy?

Variable 1: Years of service (Ordinal variable. 1: 0-5 years, 2: 5-15 years, 3: 15-25 years, 4: 25+ years).

Variable 2: Familiarity with ICT. (Ordinal variable. 0: without certification, 1: A level, 2: B).

Spearman rho correlation coefficient.

Table 9. Correlation of Ordinal Variables

			ICT familiarity	Years of service
Spearman's rho	ICT familiarity	Correlation Coefficient	1,000	0,109
		Sig. (2-tailed)	.	0,331
		N	82	81
	Years of service	Correlation Coefficient	0,109	1,000
		Sig. (2-tailed)	0,331	.
		N	81	81

As is evident from table 8, there is no statistically significant relationship between the degree of familiarity with ICT and years of service (rho = 0.109, p-value = 0.331).

DISCUSSIONS AND CONCLUSION

The vast majority of kindergarten teachers in our research report lack of readiness and familiarity with distance education while they consider that distance education, as it was applied, does not meet the basic principles of Greek Curriculum for Pre-school education. Teachers showed a similar low level of readiness and familiarity in other recent research (Gkoros & Bratitsis, 2021; Churiyah et al., 2020) although there were cases of research in which the level of readiness was mostly in adequate levels with their data leading to the conclusion that there was a corresponding improvement and progress during the implementation of Distance education (Angelopoulou, 2021). Therefore, the state could implement some courses in order for teachers to become familiar with educational innovations in the field of distance education.

In addition, the majority of the participants report difficulties related to the lack of technological equipment both in the school units and within the families and the needs for computer literacy and electronic equipment that came along with the implementation of distance education. Difficulties are also created by the lack of interest on behalf of the parents, the time of implementation of the lessons that were carried out at noon but also the incomplete computer literacy of the teachers. The reference to connectivity and networking issues is also noteworthy. The above data are in agreement with several data of international research (Angelopoulou, 2021; Gkoros & Bratitsis, 2021; Foti, 2020; Sari & Nayir, 2020; Rasmitadila et al., 2020; Salman, Alkathiri & Bawaneh, 2021; Hosszu & Rughinis, 2020; Churiyah et al., 2020; Hebebci, Bertiz & Alan, 2020; Sikirit, 2020). Therefore, the creation of a wide-scale modernization of the material and technical infrastructure of the schools must be accelerated, as well as giving incentives to the citizens to modernize their own home facilities as well.

It is widely accepted that teachers had no experience in Distance Education, which is admittedly an unusual form of education for young children (Gestardo, 2020, as cited in Campos & Vieria, 2021; Yildirim, 2021). As Darling-Hammond & Hyler (2020) characteristically stated, new circumstances created many new needs for teachers. Alan's (2021) research highlighted the fact that teachers need both practices that psychologically encourage their efforts as well as improvement of their technological capabilities, increase of interactive resources and consolidation of a more flexible and user-friendly e-learning platform that facilitates both teachers and students and their families. More specifically, the need to improve teachers' technological skills has been highlighted by other studies such as the Starting Strong and Learning International Survey (TALIS Starting Strong) according to which teachers feel less confident in using technological tools to enrich and support learning (OECD, 2020). In fact, many other studies (Dayal & Tiko, 2020; Keengwe & Onchwari, 2009) have shown as well that teachers have difficulties in using and integrating new technologies in their teaching practice and that they need training in such fields. In the above context, therefore, the results of the research argue that it is of utmost importance to provide professional development opportunities to teachers, especially in what has to do with distance education strategies as well as their support for improvement of their technological readiness.

Furthermore, one of the points that needs attention is the negative views of teachers regarding the integration of distance education in Kindergarten. They consider that it is less effective in relation to conventional learning and in the development of students' social skills. Other than that, participants believe that preschool students have difficulty in the independent use of technological means and that distance education does not promote the interest and participation of young students. Recent research in Greece has shown that the majority of teachers believe that the use of new technologies in education enhances the interest and motivation of students to learn and the effectiveness of teaching through the use of the multi-sensory information retrieval pathway, forming a playful and active character, which in this way can be adapted to the needs, capabilities and pace of students (Angelopoulou, 2021). Consequently, one must admit that the need for interactive sources of distance education that provide attractive and meaningful interaction to students is imperative. Just like interaction with peers, the involvement of interactive sources deepens the teaching process and is a fundamental element of a high quality distance education (Darling - Hammond et al., 2020). Of course, the use of materials suitable for young students is of similar importance and for this purpose teachers should be supported with both information and resources related to interactive tools (NAEYC, 2012). In this regard, the responsibilities of the State are more than obvious in order to achieve the desired goals that we underlined, such us equipping schools with the appropriate sources of interactive tools.

Regarding the necessary presence of an adult supervisor and the general participation and consultation of the school with the students' families during distance learning, the participants consider that it is a key inhibitory factor in the integration of distance education in the kindergarten. Therefore, the fact that young students need their parents to support them during distance education, has made them a "key cog" in the whole process and an essential element of it (Lau & Lee, 2020). However, most parents have difficulty trying to cope with this role, which can be very demanding, especially for those parents who work or have to care for more than one children at home or a child with disabilities (Lee et al., 2021; Dong et al., 2020). As a result, teachers were entrusted with another role, that of informing and guiding the families in order to fulfill their new duties. In order to be able to have a minimal future integration of distance education in kindergarten it is obviously crucial to take measures to facilitate these tasks by both parents and teachers. One way to achieve this, according to Alan (2021), is by investigating the needs of families and demarcating the points that need improvement so that various online information programs can take place through the school counseling services or through states' services or even by taking advantage of other means such us educational television. However, we must be very cautious about the integration of distance education in kindergarten, as the above mentioned issues can be addressed in one way or another, but the age, which is clearly very young in pre-school children, although it is not a socio-economic parameter of students, it is the main factor in exacerbating "digital inequality" and unequal opportunities (Pramling Samuelsson et al., 2020; Yang et al., 2010).

Last but not least, as a result of our research being limited to a specific region of the country, the results cannot be safely generalized to the entire population of the country but they do literally represent the targeted population of our study which accounts for the region of Epirus. However, our research project highlights general tendencies that can further promote new studies on larger populations, in other regions or countries with the aim of a deeper and more detailed understanding of this challenging issue.

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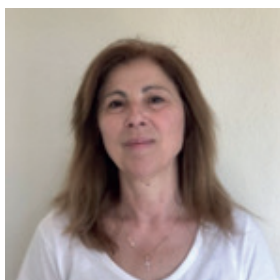
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EFL TEACHERS' VOICE ON THEIR PREFERRED STRATEGIES IN TEACHING EFL WRITING DURING THE PANDEMIC: INVESTIGATING THE ROLE OF TECHNOLOGY

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ABSTRACT

This study endeavored to gain insights into English as a Foreign Language (EFL) preferred strategies in teaching EFL writing during the pandemic, particularly dealing with technology use. Six writing teachers from various universities in East Java, Indonesia, participated in this study. They were asked to respond to interview questions that were based on Lee's (2017) five categories of technology use in a writing class and Chi's (2009) Interactive-Constructive-Active-Passive (ICAP) taxonomy levels. Thematic analysis of the interview data revealed that five teachers managed to use technological tools in all five categories of technology usage, with the self- and peer-evaluation categories being the most frequently used. They were also able to conduct activities in all of the ICAP taxonomy levels, although some technical issues and students' factors hindered the students from being fully engaged in the lessons. Lastly, the experience of integrating technology in the online writing class during the pandemic resulted in a moderately optimistic view by the teachers on technological integration in future onsite classes. It is recommended that the government and educational institutions provide support in terms of infrastructure, facilities, and professional development training in technology usage for teachers, especially for those who teach in remote regions.

Keywords: COVID-19 pandemic, ICAP framework, strategies, technology usage, writing.

INTRODUCTION

It is an understatement to say that the COVID-19 pandemic has utterly altered the education paradigm. One of the silver linings of the outbreak is that teachers became suddenly, willingly or not, conversant to some extent with technology in the virtual classroom. This phenomenon holds true for the English as a Foreign Language (EFL) teaching milieu, specifically in writing courses. Online EFL writing teaching poses its challenges for teachers due to its inherent structural difficulties and the language expertise required to complete writing. The pandemic, and the resulting online education, have made it much more challenging. Motivating students, keeping online lectures engaging, and preserving the efficacy of online classes are some of the difficult issues that EFL teachers face at that time (Selvarasu et al., 2021). This online learning phenomenon is undoubtedly challenging for EFL language learners, and Indonesian students are no exception. Unlike other communicative skills, writing is more difficult to teach online due to its intricate intersectionality.

According to Westwood (2008), writing is mostly paper-based and uses other types of substantial media, such as multimedia platforms. On the other hand, students require actual direction and feedback from teachers to improve their writing process. Furthermore, failing to satisfy the technological demands of online education can make students feel disconnected from their friends and lecturers, as well as experience disappointment (Bush, 2021)students can receive oral feedback in conjunction with written corrective feedback. Forty-four freshman students from an advanced writing class in the ELT department of a small private university in Istanbul participated in the study. During the semester, three high stakes essay assignments were given. For the first essay only written corrective feedback was given, but for the subsequent two essays students received a combination of written and oral feedback through screencasting. Screencasting was originally used because it was purported to be more efficient than written corrective feedback. While it wasn't found to be more efficient for the teacher, it was enthusiastically embraced by the students. To gauge the students' perceptions, a survey was given at the same time as the final exam. The survey included a section for demographics, four open-ended questions, and 28 Likert scale-type questions. The Likerttype questions represented nine categories of inquiry including both practical and affective factors. The results indicated overwhelmingly that the students perceive screencast feedback as more pleasant and more effective than written corrective feedback alone. The technique is appropriate to the twenty-first century classroom and the learning styles of modern students. It is recommended that this technique be adopted in academic writing classes.","container-title":"Innovation in Language Learning and Teaching","DOI":"10.1080/17501229.2020.1840571","ISSN":"1750-1229, 1750-1237","issue":"5","journalAbbreviation":"Innovation in Language Learning and Teaching","languag e":"en","page":"473-486","source":"DOI.org (Crossref. Furthermore, students are less engaged in writing. It appears that the only reason they write is to complete the classroom-based assignments. In actuality, it is quite difficult for teachers to make their students enjoy their writing exercises.

As a result, it is critical to use excellent online writing tools to bridge the gap between learners and teachers by creating an interactive, engaging, and effective learning environment in which students receive thorough input. Thus, teachers who initially struggled to integrate technology into EFL writing have been compelled, much more so during the pandemic, to develop their digital literacy in order to teach writing effectively (Williams & Beam, 2019).

The ways teachers use technology in their writing classes have been reported in several studies (Aldaghri & Oraif, 2022; Chen, 2016; Fithriani & Alharbi, 2021; Fitria, 2021; Jeong, 2016; Reynolds et al., 2020; Shang, 2017). Teachers have used technology to the extent that they understand and are able to use it to improve students' writing ability (Al-Wasy, 2020; Regan et al., 2019; Williams & Beam, 2019). As mentioned by Al-Wasy (2020) in his meta-analysis, most studies focused on experimentation with technology. Other studies included a guiding framework to integrate technology in writing classes (Ammade et al., 2020; Aniq et al., 2021; Ching et al., 2016; Tai et al., 2015). However, these research studies tend to focus on Technological Pedagogical Content Knowledge (TPACK) rather than on how teachers might engage students in active and interactive learning through technology in writing classes. Besides, teachers' perception or belief in the affordances of technology is still rather unstructured (Aniq et al., 2021; Regan et al., 2019). Therefore, further studies are needed to derive lessons learned from pieces of evidence to establish a clear framework for teachers in selecting technology for learning (Li & Storch, 2017). To fill the void, this study intends to report how teachers engaged students in active, collaborative, and constructive behaviors while minimizing

passiveness in online EFL writing during the pandemic by integrating appropriate teaching technology. The unravelling of EFL teachers' preferences in the use of technology to enhance the online writing classroom during the pandemic will provide insights into future classes in the post-pandemic. Accordingly, categories of technology usage in a writing class, frameworks for technological integration, and a review of recent related research are presented.

Teaching Strategies Involving Technology Usage in the EFL Writing Class

The teaching of EFL writing has employed various strategies to ensure that students can be engaged well and that their writing skills can be improved. However, the strategies systematically employing technology usage have been known widely only recently. Williams and Beam (2019) carried out a review of 29 empirical articles from 2002 to 2017. As demonstrated by the findings, in educational contexts, computers and a variety of digital technologies, programs, applications, and web-based learning environments have been utilized to teach writing. According to the review, as a result of technology-mediated writing instruction, students' composition processes, writing abilities, and awareness of new literacies have also improved. Technology usage has become more intense in the era of the COVID-19 pandemic since teaching has been conducted online. Although teachers had obstacles when integrating technology into their writing classes, students' participation in writing assignments was boosted by the use of technology, which facilitated social interaction and peer collaboration (Alsmari, 2019; Jeong, 2016). Williams and Beam (2019) also revealed that technology-mediated writing instruction and the development of students' 21st-century literacy abilities necessitate immediate, high-quality professional development for teachers.

To raise the degree of engagement and interactions in the classroom, teachers could apply the strategies in integrating technology in the EFL online writing class. For example, Li (2018) drew five principles for integrating technology in wider EFL classroom contexts. These principles address the advantages and functions of technology, support the needs of students, incorporate the technology rather than add it to education, consider the teacher's role, and enhance the authenticity of both the language used and the task itself. Lee (2017) categorized technology integration in teaching and assessing writing into four types: writing platforms, technology-enhanced writing tasks, technology and teacher evaluation on students writing, and technology in self and peer feedback/evaluation. Many studies also include social media as a writing tool in writing classes (Fithriani & Alharbi, 2021; Prasetyawati & Ardi, 2020). Therefore, this study intends to adopt Lee's (2017) categories of technology integration and adapt them by adding the social media category, as shown in Table 1.

Table 1. Teachers' strategies of technology integration in online teaching and learning (adapted from Lee, 2017, pp. 123-145 and expanded with a "social media" category).

No	Writing tool categories	Tools	Functions	Activities
1	Writing platforms	Blogs, Google docs, Jambord, Storybird, Wikis, and platforms developed by institutions	Writing collaboratively	Students work together on a collaborative writing project
2	Technology-enhanced tasks for classroom writing	Blog-based writing, digital story-telling, email collaborative writing, writing for Wikis	Providing engaging writing tasks	Students work in groups or individually to produce a digital project with writing tasks, digital images, and digital videos.
3	Technology and teacher evaluation of student writing	Automated writing evaluation, screencast	Digital recording software, bringing teacher's presence in the feedback	Providing communicative feedback
4	Technology in self- and peer evaluation	Grammarly, concordancing, prowriting aids, Microsoft word tools for spelling, structure, and vocabulary	Helping students edit and review their own or peers' writing	Students utilize a thesaurus to find synonyms or antonyms
5	Social media	Edmodo, Instagram, Facebook	Online forum writing for public	Students produce written work to communicate and participate in a discussion.

Despite all the sophisticated tools, teachers should consider how the tasks could truly engage students. Instead of serving as an 'add-on' to current teaching methods, technological tools should be integrated into education as a whole. As a result, teachers need to be mindful of their underlying assumptions about teaching and learning when incorporating technology into the writing classroom (Li, 2018); they must consider the drawbacks of the instruments employed (Boudjadar, 2015), and students must have similar ideas in using technology in the writing class (Gleason, 2014).

Principles for Technological Integration: The ICAP Framework

Studies on the choices teachers make when using technologies for their online classrooms are commonly framed by designs and models underpinning such choices. Frameworks such as the Community of Inquiry (Garrison et al., 2000), TPACK (Technological Pedagogical Content Knowledge) (Mishra & Koehler, 2006), and SAMR (Substitution, Augmentation, Modification, and Redefinition) (Puentedura, 2006) have been extensively used by a plethora of studies investigating teachers' technological integration capability.

More recently, the Interactive-Constructive-Active-Passive (ICAP) Framework (Chi, 2009) and its taxonomy levels seem to have garnered mounting interest among researchers and educators. In postulating the framework, Chi (2009) began by defining the term 'interactive', 'constructive', and 'active' in terms of learners' overt behavior and the cognitive process underlying each activity. The resulting taxonomy was then extrapolated into a hypothesis, in which she posited an ascending hierarchy from the Passive type of activities up to the Interactive ones. Therefore, Interactive activities, for example, constitute the superior cognitive processing in the learners as compared to the Constructive ones, and are therefore predictors of the greatest learning success (Chi, 2009). A posterior work by Chi and Wylie (2014) refined the constructs into modes of engagement. Thus, the 'passive' mode is categorized as receiving information without doing other observable learning activities. It is then characterized as a 'receiving' type of activity. The 'active' mode describes a certain motoric or physical movement accompanying a covert cognitive process, such as taking notes while listening to a lecture. It is also defined as a 'manipulating' activity. Learners engage in 'constructive' mode if, while learning, they produce outputs or products distinct from the learning materials provided, and hence described also as 'generative'. Sample activities include self-explaining and drawing a diagram from a text. Lastly, in the 'interactive' or 'dialoguing' activities, learners engage in constructive discourse with peers, teachers, or even a computer program. Chi and Wylie (2014) further emphasized that the interaction should be constructive in nature, with a sufficient extent of turn-taking occurring. Therefore, learners explaining to one another, criticizing others' stand, or defending one's position is seen as constructively interactive. A table depicting each ICAP construct and its corresponding examples of learning activities is given in Table 2. It can be seen here that the attractiveness of this framework derives from its contribution to operationalizing the concept of 'active learning' (Chi & Wylie, 2014), in ascending order from the 'passive' mode to 'interactive'.

Table 2. The ICAP framework depicting activities by modes of engagement (adapted from Chi & Wylie, 2014, p. 221).

	Passive/ Receiving	Active/ Manipulating	Constructive/ Generating	Interactive/ Dialoguing
LISTENING to a lecture	Listening only	Listening while copying or taking notes	Reflecting, drawing concept map, asking questions	Defending or arguing a position in dyads or small groups
READING a text	Reading aloud or silently	Reading while underlining, highlighting, summarizing	Self-explaining, integrating across texts, taking notes in one's own words	Asking and answering comprehension questions with a partner
OBSERVING a video	Watching only	Watching and pausing, playing, doing fast-forward or rewind	Explaining concepts in the video, comparing and contrasting with other materials	Debating with a peer about justification, discussing similarities and differences

The framework has been used by other studies in the field of education, hailing from various disciplines. It has been utilized, for example, to provide empirical evidence to the taxonomy levels to evaluate the design and implementation of language art lessons (Roscoe et al., 2014), examine the types of dialogue patterns in group dyads that promote learning (Chi & Menekse, 2015), and conduct a large-scale, long-term project beginning with teacher training of the ICAP framework, implementation in the classrooms, and measurement of students' learning gain (Chi et al., 2018). In a recent publication, Chi (2021) advanced the ICAP model as the solution to bridge the widening gap between the theory of learning and teaching practice.

Not surprisingly, several recent studies employed the ICAP framework in technology-mediated learning. Empirical studies in this respect include an investigation of the use of an online annotation tool *hypothes.is* in a reading class (Marissa, 2021), the impact of a generative activity, namely writing an explanation during pauses, in a multimedia lesson (Lawson & Mayer, 2021), the effect of technology support (e.g., PowerPoint, YouTube, WhatsApp) on students' learning outcome (Wekerle et al., 2020), and the deployment of augmented reality in collaborative activities among young learners (Wen, 2020). All of these studies evidenced the success, to some extent, of engaging students with technological affordances. Other studies informed by ICAP principles involved preservice teachers' training programs and in-service teachers' professional development activities, aimed at either mapping the teachers' technological integration practice (Trevisan & Smits, 2021), their selection of learning activities (Du et al., 2020), or their cognitive engagement when taking part in an online professional development program (Atapattu et al., 2019). Among the three studies, it was interesting to note that the preservice teachers who were the participants in Du et al. (2020) preferred to engage in the Passive mode of instruction, as it was perceived to guarantee better grades. In terms of pedagogy, Henderson (2019) provided empirical evidence that students exposed to peer instruction when learning physics achieved greater learning gains than those who were not. Finally, Deepika et al. (2021) aligned technology and pedagogy by mapping the various pedagogy into the ICAP framework, illustrating each ICAP construct with the corresponding technological tool for online engineering class.

Thus, it can be seen that, in recent times, scholars have turned their attention to the ICAP framework as a valuable conceptual underpinning for integrating technology in online lessons in ways that promote engagement, active learning, and collaboration among students. Hence, in alignment with the purpose of this study, the ICAP framework is used as the scheme to guide the mapping of EFL teachers' strategies in teaching writing online during the pandemic.

EFL Online Writing Classes during the Pandemic

Several studies on EFL online writing during the COVID-19 pandemic reveal positive evidence and challenges in integrating technology into the teaching and learning activities and assessment processes. Svyrydjuk et al. (2021) classified online second language writing development activities into educational interactive activities that enhance students' engagement to use English and controlling interactive activities that cover testing and assessing writing performance. Related to the educational interactive activities, the learning tools proven to be effective in online writing classes include videos (Copeland & Franzese, 2021; Maru & Nur, 2020), Automated Writing Evaluation/ AWE (Barrot, 2021), Google Classroom (Rosyada & Sundari, 2021; Shelvam & Bahari, 2021), Google Doc (Yee & Yunus, 2021), Pixton (a comic scripts maker) (Cabrera-Solano et al., 2021), Instagram (Bestari, 2020), and Padriseup, an online collaborative writing tool (Dal et al., 2021). In addition, Tarihoran et al. (2022) suggested Facebook to boost writing achievement, but this tool could only engage students with a positive attitude towards CALL utilization. Also, Al-Jarf (2022) proposed class blogging as a complement to EFL writing instruction, where students practiced writing on a specific topic assigned by the teacher, and could give or receive comments simultaneously.

Online assessment for writing classes can be a great challenge for both teachers and students. For online self-assessment, students can access available corpora and apply data-driven learning (DDL), which has been reported to be beneficial in helping students correct their errors in writing (Zhu, 2021). For teachers, online assessment, especially formative assessment, may either be advantageous or troublesome depending on teachers' backgrounds and experience with the application of ICT (Zou et al., 2021). Zou et al. (2021) found three types of teachers' views on the utilization of ICT for online formative assessment. The first type

is teachers who are hesitant due to inadequate knowledge of the integration of technology to assess writing and lack support from the institution, and who consider online assessment as a disturbance. Meanwhile, teachers who believe in the benefit of online assessment and gain institutional support even though they may have insufficient ability in ICT integration regard this kind of assessment as assistance. This kind of teacher would make an effort and choose the simplest integration. The last type is teachers with sufficient knowledge and experience in ICT integration, and they utilize ICT as an integral part of online assessment confidently.

Other challenges, more than technical problems and an internet connection, for online writing classes during the pandemic, include students' low motivation (Bui, 2022), plagiarism (Kurtianti et al., 2021; Setyowati et al., 2021; Sheerah et al., 2022), and interaction (Tusino et al., 2021). Nevertheless, Stewart's (2021) investigation on one part of the community of inquiry framework related to interaction called social presence concluded that even though the interaction in the writing class was virtual and not physical, the students considered their teacher and classmates as real persons having real interactions by expressing their sense of humor and sharing emojis.

From what has been presented, the challenges and opportunities presented to EFL writing teachers, especially when teaching writing online during emergency remote learning, necessitate a systematic investigation of the strategies teachers use in making online writing class an engaging and enjoyable learning experience, particularly in light of the writing tools' category and an active learning framework such as the ICAP. The outcome of this study can then shed light on the future strategies of writing teachers in incorporating technology into the classroom in any teaching mode: onsite, online, or hybrid. In this way, this study also addresses a contextual gap in the ICAP literature, which has yet to explore the ICAP framework's application in a writing class. In this regard, the present study is aimed to answer the following research questions (RQs):

1. What are the EFL writing teachers' preferred strategies for using technology in online classes during the pandemic in Indonesia, in line with the five categories of writing tools?

2. How are those strategies mapped into the ICAP framework in relation to engaging students in active learning? How did the writing teachers perceive their students' engagement in those activities?

3. What were the experiences of EFL writing teachers in using technology during the pandemic, and what were their expectations in using technology for future teaching practice?

METHOD

Research Design

This study is primarily designed with a qualitative approach, in line with the aim of this research, namely to gain direct information from the participants about their actions and motivation within a certain context (Creswell & Creswell, 2017), which in this case is the teaching of EFL writing during the pandemic. In particular, this study adopted a multiple, descriptive case study design (Yin, 2018). In this research, the "cases" are the Indonesian EFL writing teachers at the undergraduate level. The cases are also bound geographically (Indonesia) as well as chronologically (during the pandemic). Hence, the phenomenon under study in this case is the teachers' preferred strategy in teaching EFL writing, in order to elucidate the role of technology in such strategy.

Participants and Context

The participants in this study were selected using the criteria of information-oriented selection (Brinkmann, 2013), in which the aim is to achieve maximum variation among the interviewees in order to obtain rich data. This principle, together with the researchers' extent of networking, brought together six EFL faculty members who have taught or are teaching a writing course. They constitute a purposeful selection of a mix of gender, educational qualifications, teaching experience, and teaching locations. Thus, two participants hail from the capital city of the province (Surabaya City – urban area), two are from a smaller city (Kediri City – rural area), and the two others are from an even smaller city (Tulungagung Regency – rural area). There are four female participants and two male participants. They have various lengths of teaching experience, and all of them have finished their Master degrees. The participants' demographic data are shown in Table 3.

Table 3. The demographic data of the participants.

Participant	Gender	Age	Educational Qualification	Teaching experience (Years)	Location type
P1	Female	24	Masters	1 year	Urban area
P2	Male	39	Masters	12 years	Urban area
P3	Female	38	Doctorate	14 Years	Rural area
P4	Female	33	Masters	7 Years	Rural area
P5	Female	40	Masters	10 Years	Rural area
P6	Male	43	Doctorate	14 Years	Rural area

Related to the context of this study, the participants were lecturers of online writing courses from three different universities, as indicated in the location stated in Table 3. All of the participants were teaching English department students of various semesters, and the time allocation for the courses was approximately 100 to 200 minutes per week. The courses were held both synchronously and asynchronously, depending on the regulations of the university. For P1 and P2, the university provided Zoom Pro account for the lecturers. Thus, they had to hold synchronous classes, whereas for other participants, synchronous classes were optional since they had to provide Zoom or other applications by themselves. In practice, P3, P4, and P5 had both synchronous and asynchronous meetings, while P6 only held asynchronous classes using WhatsApp.

Instruments

The sole instrument used in this study is a set of qualitative interview questions. Qualitative interview was deemed to be the appropriate instrument due to its ability to harness data on "how" the lived experience of certain individuals are (Brinkmann, 2013), in accordance with the general aim of this research, i.e., to reveal EFL teachers' strategy and instructional practice during the pandemic. The interview questions were developed by the researchers themselves, being guided closely by the research questions. After some deliberations, it was decided to formulate six questions, two for each research question. The complete list of the interview protocol is attached as Appendix 1. In order to validate the questions, one of the participants was interviewed by three of the researchers, with two of them acting as observers. At the end of this first interview, some of the questions' formulations were adjusted for clarity, and the amended questions were used for subsequent interviews.

Data Collection

The data were collected through semi-structured interviews, using mainly the questions shown in Appendix 1 and adding more questions or clarifications during the actual interview as the need arose. Before conducting the interview, a consent form was sent to the participants, and they were asked to read and sign the form to indicate their agreement to be interviewed. The consent form also mentioned the voluntary nature of their participation, the commitment to safeguard confidentiality, and that their involvement in the research should not entail a known, substantial risk.

After the interviewees returned the consent forms, the interview dates and modes were arranged with them, depending on their availability and preference. Of the six interviewees, two were interviewed through Zoom video conference, one participant was personally interviewed face-to-face, and the rest used asynchronous, written interviews. The interview was conducted in English, although some participants preferred to provide extended responses in the local language. At the beginning of the interview, the researchers discussed the interview's goal and specific aspects, like the ICAP framework, for example, with each of the participants, in order to align the understanding of both parties. Each face-to-face interview lasted around 30-60 minutes.

Data Analysis

For the recorded interview, the audio files were first transcribed, the local language was translated to English, and the transcription was sent back to the participants to be checked and confirmed by them as part of the member-checking procedure to ensure the validity and accuracy of the data. The final transcripts were then analysed based on Miles et al.'s (2014) interactive model, which includes data condensation, data display, and conclusion drawing or verification. In the data condensation, the responses of all participants pertaining to each research question were grouped together to facilitate data visualization. Then, in the data display, some keywords and phrases were coded in accordance with the research questions (RQs), specifically employing the concept-driven coding method which made use of pre-determined codes (Brinkmann, 2013), or what Saldana (2021) termed as Structural Coding. An example of a code for RQ1 was "writing platform", and so words such as "Google Docs" and "Canva" were highlighted. Another sample of a code for RQ2 was taken from the ICAP framework like "Passive", and so phrases such as "listening to my lecture" or "watched a video" were singled out. Lastly, the codes for RQ3 were "past challenge", "past benefit", and "future hope". Finally, in the conclusion and verification, the data analysis included the 'back-and-forth' interaction with the data to locate relevant quotes or further evidence (Miles et al., 2014). During the initial coding phase, three of the authors worked independently on the interview transcripts, each focusing on one RQ. Upon completing the first round of coding, the three authors presented the coding result to each other, somewhat akin to the peer debriefing (Lincoln & Guba, 1985) procedure intended to increase the coding credibility. This process resulted in further discussion on code interpretation, such as whether Mendeley should be coded as "teacher assessment" or "self-assessment". The discussion continued until a satisfactory qualitative code agreement was achieved.

FINDINGS

The EFL Teachers' Preferred Strategies in Using Technology in Online Classes during the Pandemic

With the potentially limited interaction and direct communication related to the teaching and learning process between teachers and students, supporting writing teaching technology is needed to facilitate the online learning process well. Related to the first research question, five of the six participants used both synchronous and asynchronous meetings as the teaching modes, while one teacher used full asynchronous sessions although the university required the use of the two modes. Moreover, in relation to the five categories of technology integration in teaching writing, the findings reveal that they utilized various kinds of technological tools based on the need of the course and their digital literacy in teaching writing tools, as summarized in Table 4.

Table 4. Teachers' use of technology integration in teaching writing.

Writing tool types	Participants	Tools
1 Writing platforms	P1	Canva
	P2	Microsoft Office and Google Docs
	P4	Google Docs
2. Technology-enhanced tasks for writing classroom	P1, P2, P3, P4	Google Classroom, LMS from university
	P2	Mind map online Bubbl.us
	P1, P4	Nearpod, Google Docs
3. Technology and teacher evaluation of students' writing	P2	Mendeley
	P4	Turnitin
4. Technology in self- and peer evaluation	P1, P2	Microsoft Office, MS Word, Smallseotool
	P2, P4, P5	Grammarly
	P5	Paraphrase-tool.com, Quillbot.com
5. Social Media	P1, P2, P4	Instagramw
	P2	Edmodo
	P4, P6	WhatsApp

The results of the interview also show that the participants have succeeded in utilizing various technological tools according to the initial function of the tools. In the Writing Platform category, P1 has made use of Canva which can increase creativity and interest in writing recount texts. P1 said:

> "In the first meeting, I used Canva as visual aid 'cos I believe they can be [attracted] by the slides. They can go to their slide and write about anything, a random topic, for five minutes."

In the second category, P2 and P4 succeeded in utilizing technology-enhanced tasks in writing class, such as Google Docs as a platform for collaborative writing. As stated by P4:

> "Then I made Google Documents for each student that could be accessed within the group. One group had one folder, consisting of 3 files of Google Docs."

P1 added that some of the tools are technology-enhanced tasks since they could provide a place where students could write collaboratively, like Google Docs and Nearpod. P1 said:

> "So Nearpod can be used as collaborative writing and brainstorming tool.'"

In this point, P2 utilized an appropriate tool when he used Bubbl.us in helping the students develop their ideas in writing; P2 said:

> "I used Bubbl.us. It helps them to make some kind of mind mapping using that application. It trains students to develop their ideas into mind maps or spider webs."

However, some participants misinterpreted this second category. Technology-enhanced task is inaccurately interpreted as a place to give assignments. In fact, this category is more about how teachers can use technology to make their tasks more varied. For example, P3 thought that using Google Classroom falls under technology-enhanced tasks. P3 said:

> "Yes, I used the technology-enhanced task in the form of Google Classroom. Through it, I asked them to do peer and self-assessment by giving them guidance…"

In relation to the third and fourth categories, two teachers used tools under the technology and teacher evaluation category, such as Turnitin by P4 and Mendeley by P2. These tools help them in evaluating the students' ways of writing references and checking the issue of plagiarism. Under the fourth category, technology for self and peer evaluation is the most frequently used all participants, such as P1, P2, P4, and P5. P2, in particular, was very much concerned with plagiarism, so he said:

> "I also introduce them to simple grammar-checking and also paraphrasing tools. The name is Smallseotool. That is free as well. So, they can check in terms of their similarity, and they can also use it for paraphrasing."

However, P3 chose to implement this method manually by offering writing guidance to students in order to review their own and peer work. Regarding the fifth category, social media, only P1 and P2 used social media (Instagram and Edmodo) in teaching writing, but did not use it throughout the course.

The EFL Writing Teachers Preferred Strategies Mapped to the ICAP Framework

The second research question seeks to map the strategies that the six writing teachers used, particularly in terms of technological deployment, into the ICAP framework (Chi, 2009), as well as to gain the teachers' insight on the impact of such strategies on the students' engagement.

In general, it could be seen that all of the teachers enacted the Passive mode mainly by getting students to watch videos (P2, P5), listen to lectures in synchronous sessions (P1), and read texts uploaded to Google Classroom or sent via WhatsApp (P5, P6). Although it was not explicit in this part of the interview, it could be inferred from their responses elsewhere that P3 also assigned the students to read the handouts uploaded to Google Classroom independently, while P4 made use of videos that she sent to the WhatsApp group to explain the materials.

For the Active mode, the responses of the participants greatly varied. P1, for example, instructed the students to identify the structure and language features of the texts, while P2, in addition to structure identification, required the students to browse the websites of indexed journals in order to read and cite from there. P3 considered the "doing the exercises" as the Active part of her lesson, and P4 categorized the peer-correction

activities in Google Docs as Active. P5 mentioned that her students at times took notes from the videos they watched, and lastly, P6 asked his students to highlight the texts in order to summarize them.

While not explicitly mentioned in the interview, the responses of the participants in other parts of the questions can be inferred as activities belonging to the Active category. For example, P1 mentioned that she asked her students to check for grammatical mistakes in Microsoft Word. Similarly, P2 made use of Grammarly for grammar check and smallseotools.com for plagiarism detection. P3 gave a rubric for her students to do self-assessment as well as peer correction. Like P2, P5 introduced her students to Grammarly, thesaurus.com, paraphrasing-tool.com, and quillbot.com for the students to improve their writing independently.

Since the subject matter is Writing, all of the teachers interviewed considered the writing tasks as Constructive. Hence, P1, P3, P4, and P5 mentioned the individual tasks of writing an outline, a paragraph, a text, an abstract, or an essay, as the Constructive part of their teaching. In addition, P2, and indirectly, P4, included their online mind-mapping activity as Constructive. Interestingly, P6 required his students to write a summary of the text in *Bahasa Indonesia* (the participants' first language) to ensure that the students truly comprehend the content. P2's use of Mendeley for students to write proper citations, and the smallseotools.com website for paraphrasing, can also be considered Constructive. Lastly, P3 regularly instructed her students to make presentations about a certain topic, as well as making explanatory videos, all of which can be considered as Constructive. She required her students to upload the videos in YouTube and submit the link in Google Classroom.

Finally, almost all of the teachers carried out a form of discussion and brainstorming in their writing classes, which they then categorized as Interactive. The discussion could be mediated through Canva or Google Docs for collaborative writing or peer feedback (P1, P2, P3, P4, P5), as well as synchronously via Zoom breakout room features or WhatsApp groups (P1, P4). P3 regularly asked her students to form groups to make PowerPoint presentations or video explanations. She often discussed the result of peer correction together, so the students could directly justify their works or their correction. P6 did not explicitly carry out any activity related to discussion among students since he admitted that his lesson was conducted exclusively through WhatsApp.

A summary of the activities and the technology used is tabulated against the ICAP framework and presented in Table 5.

Table 5. Instructional activities and the technological tools used by the participants mapped onto the ICAP Framework.

Passive	Active	Constructive	Interactive
Watching videos (P2, P4, P5) - YouTube	Text and error analysis (P1, P2, P3, P4, P6) – Google Docs, Grammarly, smallseotools	Writing outline, paragraph, texts, essays, portfolios (P1, P3, P4, P5) - Canva	Discussion or brainstorming (P1, P3, P4, P5) – Zoom or WhatsApp video call
Listening to lectures (P1) – Zoom	Paraphrasing (P2, P5) – smallseotools, quillbot.com, paraphrasing-tool.com	Mind-mapping (P2, P4) – bubbl.us	Collaboration (P1, P2, P4) – Google Docs
Reading materials (P3, P5, P6) – Google Classroom, WhatsApp	Browse for materials and citing (P2) – indexed journal websites, Mendeley	Summarizing in *Bahasa Indonesia* (P6)	Group project (P3)
	Doing exercises (P3)	Making a presentation on ppt or in video form (P3) – uploaded to YouTube	None – P6
	Note-taking (P5)		
	Text-highlighting (P6)		

In sum, even without explicit, formal knowledge of the ICAP principles, almost all of the teachers had enacted activities that were geared to engage students in active learning during online lessons. The comment of P1 represents this sentiment:

"Probably without me realizing I have already undergone several stages; like at first, the students got the Passive when they listened to my lecture about the text, and they could actively identify the structure and language feature from the example. Probably they go with the Interactive part first because they discussed with their group members about the identification of the text as well as the framework construction, and they try to produce into one text or two texts. So maybe the Constructive stage went last."

When asked whether those activities they mentioned contributed to observable engagement behaviour in the students, 4 (four) respondents replied that some students were perceived to be active, while some were not. However, the reasons for the supposed inactivity were diverse. P1 mentioned that, due to the heterogeneous grouping she created, the lower-proficiency students were leaving all the works to the higher-proficiency ones. P2 and P5 cited similar reasons for his students' apparent lack of engagement, namely unfamiliarity with the use of technology, insufficient understanding of the materials, and demotivation due to the absence of face-to-face meetings. Here is an excerpt of P2's comment in this regard:

"I find several students are active and some are not active. There are several problems. It can be because … they are not used to using the technology, and some others do not really understand the materials, and probably less motivated to discuss. It's more complicated when using technology because they cannot do the activity freely like in face-to-face activity."

P3 alleged that her students seemed inactive due to poor internet connection, and she tried to call the students' names over Google Meet to check if they were really present. Interestingly, P4 was confident that all her students generally displayed active behaviour. Lastly, P6 claimed that, since he solely used WhatsApp as the communication medium, he was unable to gauge the level of his students' engagement; he only noticed that not all students responded to his WhatsApp messages. However, with the series of tasks that he assigned, he expected his students to be actively doing the works.

The Experience of EFL Writing Teachers during the Pandemic and Expectations in Using Technology for Future Teaching Practice

Related to the experience in integrating technology during the pandemic, the EFL writing teachers reported both positive opportunities and various challenges. Furthermore, the experience of having remote teaching for writing skills allowed teachers to plan for their future writing classes and to state their expectations. The summary of both opportunities and challenges, as well as teachers' expectations based on the interviews with the six participants, can be seen in Table 6.

Table 6. Benefits, challenges, expectations, and future plans on using technology for Writing classes.

	Past Experiences		Future Plans
	Benefits	Challenges	Expectations and Plans
Teachers' perception of technological integration's impact to students	Students were interested (P1), could work easily, could participate actively and creatively, could have direct interaction (P3)	Students experienced technical problems (P1), did plagiarism (P2), had low digital literacy (P1, P2, P5), had bad internet connection (P3, P4), participated less actively (P3, P5)	Students can do active self-exploration of technology (P1), publish their works to be read by many people (P4), actively participate in class (P5)
Teachers' perception of technological integration's impact to themselves	They found it easier to collect students' work (P3), could work faster (P5)	They needed more time to explain the technology to students (P1), had less interaction with students (P2), were unable to find the appropriate platform (P6)	They want to focus only on certain tools, select a new writing tool, explore more tools (P1), use the same technological tools (P2), might not use all the tools in offline class (P3), find easy and effective peer editing tools (P4), use tools for hybrid learning (P5), find suitable and user adapted/modified friendly writing platforms (P6)

As shown in Table 6, based on their experiences, the teachers perceived that the use of technologies afforded various benefits to the students. For example, technology could positively boost students' interest in the lesson (P1), give students a chance to get exposed to digital literacy (P2), and increase students' active and creative participation during the learning process (P3). In addition, with the assistance of technology, students were able to finish the task easily and directly, as confirmed by (P3), who stated:

> "Students can work easily, and they could directly confirm their understanding or ask questions to the teacher and their friends…"

Meanwhile, technological tools were seen to benefit the teachers themselves. Hence, the use of Google Classroom helped the teachers to easily collect students' works (P3) and made teachers' work easier, too (P5). P3 said:

> "When we use Google Classroom, it makes it easier for the lecturer in collecting the work…."

Besides the benefits of integrating technology into writing classes, both teachers and students also face some difficulties. The teachers observed, firstly, that the students experienced technical difficulty in operating the technology (P1), which reduced the time for other class activities. Secondly, there was an issue of plagiarism as students might copy others' works, as reported by P2:

> "When I gave them assignments to write an essay or an article, most of them probably copy and paste from the internet. Therefore, one of my biggest problems is to get them to be aware of plagiarism issue…"

Third, teachers suspected that the students possessed low digital literacy (P2, P5). Fourth, they were beset with a bad internet connection (P3, P4), and lastly, not all students participated actively during the lesson (P3, P5).

There are two challenges from the teachers' points of view. The first is the limitation to interact with students in online teaching (P2). The second is the failure to find the appropriate technology (P6) so P6 only used social media (WhatsApp) to teach writing. P6 stated:

> "Due to my personal drawbacks, I do not find a platform which meets and fits the teaching and learning needs I plan for my course."

In terms of expectations and future plans, some of the participants of this study mentioned what they expected their students to do in the future and what they planned for integrating technological tools into their next writing class based on the challenges they had experienced earlier. The students were expected to actively explore the technology by themselves outside the class (P3) and able to publish their writing later (P4). The teachers also wanted the students to have high motivation in participating during the writing lesson as expected by P5:

"Students are expected to get involved and engaged in the class of writing with high motivation assisted by writing tools."

The future plans made by the teachers for themselves varied. Three teachers (P1, P4, and P6) planned to search for new technological tools, as stated by P4:

> "I hope there will be a writing application/website that can be used easily and effectively. It should have Peer Editing tools so that students can help each other improve their writing skills."

On the contrary, one teacher (P2) wanted to use the same tool for his future class. In addition, one teacher (P3) did not want to have more online writing classes, while P5 stated that she needed to prepare for blended or hybrid writing lessons in the future.

DISCUSSIONS

The present study attempted to address three research questions: 1) What are the EFL writing teachers' preferred strategies for using technology in online classes during the pandemic in Indonesia, in line with five categories of writing tools? 2) How are those strategies mapped into the ICAP framework in relation to engaging students in active learning? How did the writing teachers perceive their students' engagement in those activities? and 3) What were the experiences of EFL writing teachers in using technology during the pandemic, and what were their expectations in using technology for future teaching practice?

Concerning the first Research Question, the results indicated that, in general, the teachers attempted to make the students engaged in the learning process by employing both synchronous and asynchronous teaching strategies, as well as making use of all the five-writing tool categories. The second category of technology-enhanced tasks for the writing classroom and the fourth category of technology in self-and peer evaluation gained the most attention from the participants. Google Classroom as the learning management system is the most frequently used by the participants (P1, P2, P3, P4, and P5). This finding shares similarities with the former studies focusing on the use of Google Classroom (Rosyada & Sundari, 2021; Shelvam & Bahari, 2021).

For the fourth category, technology in self-and peer evaluation emphasized the use of automated writing evaluation (AWE). However, according to Lee (2017), the choice of appropriate online tools is essential in L2 environments when learners have low proficiency skills. As a result, careful attention must be given to the usage of AWE in connection to the students' writing proficiency, whether it has a positive or negative effect on them. It is essential for teachers to give not only guidance but also training and practice to the students so that they can use the online resources confidently and appropriately. P3 mentioned that the tools were unsuitable for beginners since the tools gave automated correction and contributed less to the students' writing proficiency, specifically in process writing pedagogy. However, no conclusive results have been found in the AWE study comparing machine and teacher feedback. AWE only contributed moderately to students' writing quality upon revision (Lee, 2017), while teacher's feedback is generally shown to improve the quality of students' revision rather than their overall writing proficiency (Stevenson & Phakiti, 2014).

This finding suggests immediate professional development for writing teaching. As Williams and Beam (2019) revealed, technology-mediated writing instruction and the development of students' 21st-century literacy abilities necessitate immediate, high-quality professional development for teachers. Teachers' technology-enhanced pedagogy has to be strengthened so that they are more confident in allowing students to take charge of their own learning and participate actively. A teacher's pedagogy, technology, and context expertise is required for this purpose. Accepting that technology integration does not mean just "adding" more technology is necessary for teaching today. This realization necessitates that teachers have a thorough understanding of the function of technology in education, as well as the means by which they might integrate technological advantages into their lesson plans.

In terms of mapping the teachers' preferred strategies in teaching English online classes during the pandemic into the ICAP Framework, the findings revealed that all but one teacher, even without any knowledge of the ICAP principles, applied all of the four ICAP modes of engagement in continuous succession, in a way that the lower modes scaffold the successive ones, as recommended by Roscoe et al. (2014). As mentioned by P1, she started with the Passive activity (students listened to her lecture), followed by Active (they identified the structure of the text), then Interactive (students discussed a text outline), and lastly, Constructive (students wrote the full-text outline). However, as can also be seen from P1's response, most teachers regarded the Constructive mode as the culminating activity, perhaps due to the nature of writing being seen as a productive skill. In this sense, the ICAP Framework is useful not only to ensure that teachers enact activities under all ICAP categories to engage students in active learning but also serves to sequence the activities from the Passive to the Interactive (Roscoe et al., 2014), while at the same time adapting the activities' order to suit the course requirement.

Since Interactive activities are postulated to result in the greatest cognitive processing and, therefore, superior learning outcomes (Chi, 2009), it is natural that teachers should carry out more of such activities. The teachers in this study reported conducting some Interactive activities leveraging technological tools. However, Chi et al. (2018) pronounced some caveats in this respect. Their studies revealed that teachers experienced the greatest difficulty in designing Interactive activities, which might be caused by the erroneous focus on the external form of collaboration (how many students per group, the groups' composition, etc.) rather than on the type of dialogues taking place. They cautioned the students by telling them that working together does not necessarily constitute an Interactive activity that results in effective knowledge generation (Chi et al., 2018). Chi and Meneske (2015) noted that the ideal Interactive activity is one that occurs in pairs with a substantial number of turn-taking, in which both partners contribute with "constructive" comments.

Hence, in relation to the findings of this study, writing teachers should not be complacent in thinking that activities such as "collaborating via Google Docs" truly embody engaging interaction. Besides perhaps limiting the number of group members to two, this type of online collaboration will need to be in tandem with synchronous discussion and close monitoring by the teachers so that it does not degenerate into online typing by the more proficient students. In addition, like what was done by P1, the group should ideally be homogenous to prevent an imbalance between the contribution of the higher-proficiency students over the lower ones. Overall, conducting Interactive activities online remains the biggest challenge for higher education teachers (Du et al., 2020; Wekerle et al., 2020).

Despite the efforts put in by the writing teachers to engage their students during online learning, it is apparent that other factors came into play, as shown by the replies of the teachers to the question of whether or not their students displayed overt active behavior in responding to the activities classified as Active, Constructive, and Interactive. Four of the six teachers reported mixed results; some students were observed as engaged, and others were not quite. While only one teacher cited technical difficulty, namely internet connection, the others pointed to various students' factors, such as demotivation, lack of digital literacy, and lower cognitive proficiency. It is also plausible that the seemingly passive students experienced a certain degree of insecurity towards active learning pedagogy, preferring the comfort of passive learning mode (Du et al., 2020). Hence, there is an urgent need for teachers to provide more explicit instructions, especially in online classes, as well as psychological and cognitive scaffolding for the students (Chi et al., 2018). Further study is needed, by way of a triangulation, to garner the students' perspective on whether the deployment of the various technological tools by the writing teachers was able to engage them cognitively, as what was done by several other studies (Du et al., 2020; Marissa, 2021; Wekerle et al., 2020)

In sum, the findings provided insight into the role of technology in promoting active learning during online writing classes. In line with Deepika et al. (2021), who mapped the pedagogical strategies of Engineering faculty members when using the Canvas LMS onto the ICAP Framework, this study also depicted the various types of technological tools at the service of teachers in the four stages of the ICAP taxonomy. Thus, this study reiterated the conclusions of Deepika et al. (2021), who affirmed the possibility of implementing any type of pedagogy in an online setting, and that of Wekerle et al. (2020), who promoted the use of technology for enhancing students' engagement which resulted in a positive gain of their learning outcome. Thus, technological affordances should continue to be leveraged even in future onsite or hybrid learning. When perceiving that not all students displayed overtly active behavior as expected, some teachers adjusted their pedagogical approaches and expectations. Indeed, teachers' manifold problems in implementing a planned pedagogical strategy, such as active learning in a real-time classroom scenario, remain unresolved (Chi et al., 2018).

Lastly, concerning Research Question 3, it was revealed that teachers' strategies in using technology for their next writing classes in the post-pandemic, either online, offline, or hybrid ones, had been planned based on teachers' experiences regarding the opportunities and challenges they encountered earlier. As for the advantages of using technology as perceived by the teachers, this study confirms Alsmari's (2019) and Jeong's (2016) findings that technology usage can enhance students' active participation. Furthermore, while the previous studies concluded that the use of technology such as Google Classroom benefited students' writing performance (Rosyada & Sundari, 2021; Shelvam & Bahari, 2021), the findings of this research proved that the teachers also considered this platform effective and efficient to help them work faster and easier, and that makes it the most popular tool as has been previously mentioned. In terms of the challenges faced by the participants of this study, they observed that technical problems and the poor internet connection of their students still occurred. In addition, in line with Bui's study (2022), students' motivation needs to be increased, especially those with low ability in digital literacy (Tarihoran et al., 2022). Another similar challenge is about plagiarism (Kurtianti et al., 2021; Setyowati et al., 2021; Sheerah et al., 2022) which encourages the participants of this study to introduce thesaurus and various paraphrasing tools to minimize this issue.

Furthermore, even though teachers should have understood the what and why before integrating the technology into their writing class (Li, 2018), after experiencing online teaching during the pandemic, they should have a better awareness of what they need to improve for their future teaching. Regardless of the participants' background and experience in the use of technology, which may influence their technology

usage in the class (Zou et al., 2021), five out of six teachers in this study had planned how to integrate the technology into their future classes. One teacher planned to integrate similar technology, whereas others expected to explore and find other technological tools which they believed would be more beneficial for their next classes. Lie et al. (2020) called this kind of expectation 'a renewed sense of commitment' (p. 208). Teachers in other countries also expressed a certain degree of enthusiasm for future, post-pandemic technological integration (Altiparmak & Cebecioglu, 2022; Karakaya et al., 2021). In addition, the support from teachers' institutions should be able to motivate them to satisfy their expectations.

CONCLUSION

This study has investigated the strategies and technological tools used by EFL writing teachers when conducting online classes during the COVID-19 pandemic. In particular, the strategies and the technological tools were mapped onto the five categories of writing tools and the ICAP Framework. In addition, their future plans for integrating technology in a post-pandemic setting were also probed into.

The qualitative data analysis from the semi-structured interview revealed that, overall, the six participants had made use of all the writing tools in the five categories, with peer- and self-editing tools (e.g., Automated Writing Evaluation tools) and the technology-enhanced task (e.g., Google Docs) receiving the greatest attention. An incidental finding demonstrated that teachers from remote areas and higher educational backgrounds tend to use less and simpler technological tools, thus suggesting the need for governmental and institutional support in terms of infrastructure, facilities, and professional development training. The participants have conducted all learning activities under the four ICAP categories in a technology-mediated environment, with the Active category being the most varied. However, teachers should make more attempts to orchestrate activities under the Interactive category due to its potential for promoting maximum learning gain. Teachers may also need to adjust the active learning pedagogy in response to various obstacles, such as technical issues or students' psychological and cognitive factors. Lastly, the teachers had reflected on their experiences in teaching writing online during the pandemic and identified several benefits and challenges concerning the use of technology. This experience, in turn, generated a modest optimism in the future use of technological tools; while some were committed to maintaining the utilization of technology or even exploring more, others planned to use less technology in an offline setting. This phenomenon might be due to the teachers' belief and literacy in the affordances of technology, as well as other contextual factors, such as the lack of institutional support, which can be the subject of future research.

The results of this study raised several implications and recommendations for various educational stakeholders. As mentioned earlier, governmental and institutional support might be needed to bridge the literacy gap that might exist between teachers in urban and rural areas. Perhaps the low self-confidence in the use of technology or negative perception of it can be overcome by providing infrastructural support such as institution-wide LMS or video-conferencing tools, technological integration policy, and monitoring, as well as continuous professional development training. EFL teachers, in particular those who teach writing, can also explore the various tools in all of the writing tool categories and the ICAP framework in order to promote student-centered learning and engagement, even in future hybrid or face-to-face meetings. For future research, this study can be further validated by obtaining the students' perspective on the teachers' usage of the technological tools. A longitudinal study can also be conducted in the future by interviewing the same participants to assess their practice and commitment to the use of technology.

This study is limited in several ways. For participants who preferred to do a written interview, there was a lack of meaning negotiation between the interviewee and interviewer. Besides, relying on self-reports always encompasses the danger that the accounts may be inaccurate or contain post-hoc justifications that blur actual practices. Nonetheless, the results of this study might give insights into the use of technology in mediating EFL writing teaching and learning during the pandemic and in the post-pandemic.

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The Interview Questions

Did you use any of the following types of technology in your online writing class during the pandemic, namely writing platform, technology-enhanced task, teacher and technology evaluation, peer- and self-assessment, and social media?

1. Please describe more at length your answers to no.1 above, in terms of the types of tools that you used, their functions, as well as the corresponding class activities.

2. According to an active learning theory, learning activities can be categorized as passive (students watching a video, etc.), active (students take notes or highlight a text), constructive (students generate additional output like a text summary, an outline, etc), and interactive (dialoguing in peer feedback, etc). How would you classify the learning activities you mentioned previously in terms of being passive, active, constructive, and interactive?

3. For the activities that you classified as active, constructive, and interactive in your previous answers, did your students display active learning behaviour as you expected? If they didn't, could you explain why?

4. Overall, how has your experience (challenges and benefits) been in teaching writing online during the pandemic, especially in relation to the use of technology?

5. What are your expectations and future plans with regards to using technology in the future face-to-face or hybrid writing class?

BOOK REVIEW

ONLINE LANGUAGE LEARNING: TIPS FOR TEACHERS
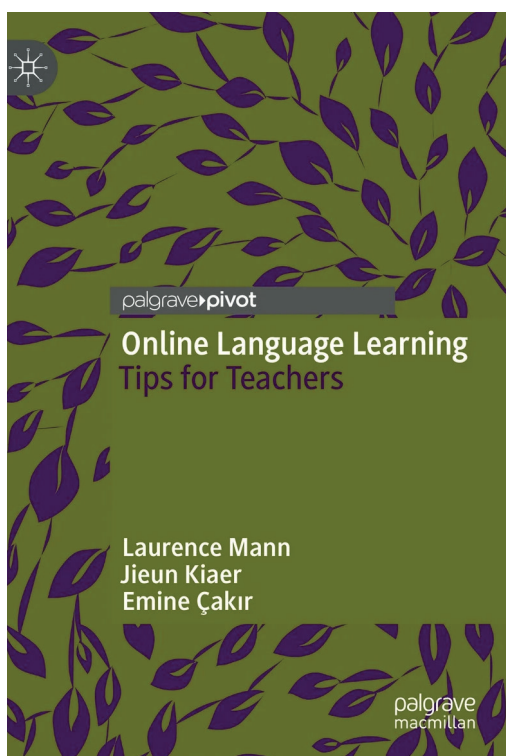### Written by Laurence MANN, Jieun KIAER, and Emine CAKIR

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INTRODUCTION

Among the many societal and educational ramifications of the COVID-19 pandemic, the move to various forms of online, hybrid, and blended learning seems to be one of those emergency responses that looks like it will become a permanent fixture. Though online learning modalities were of course available before the pandemic, the singularity of the situation meant that educational institutions were largely forced to move all of their pedagogical activities online. In seeking to transition classroom-based approaches to the digital world, this change naturally brought with it both challenges and opportunities for staff and students alike. For language teachers, given the added need to develop students' active and passive communication skills, the shift online has brought with it additional complexities and the book reviewed here provides a range of useful suggestions and guidance.

REVIEW OF THE BOOK

Online Language Learning: Tips for Teachers is part of the Palgrave Pivot short-form series. This slim but impactful 144-page volume is co-authored by three members of the University of Oxford's Faculty of Asian and Middle Eastern Studies: Laurence Mann (Associate Member, Japanese), Jieun Kiaer (Professor of Korean Linguistics), and Emine Cakir (Lecturer in Turkish). As such, the case studies presented are focused on non-Western languages; nonetheless, given the clarity of presentation, in the opinion of this reviewer this information is certainly transferable to the online teaching of all languages, an aim also hoped for by the authors of the volume (p. 15). As the book's subtitle "Tips for teachers" suggests, the work is advisory in character, with each of the four chapters centred around one core nugget of information. With the

focus being on encouraging readers to focus on their own pedagogical practice, each piece of advice is contextualised in the relevant theoretical and sociocultural context, with the latter being particularly relevant with regard to the pandemic and its legacy. This approach helps to ensure a balance that makes the resource useful from both academic and applied perspectives.

With the impact of the pandemic as a backdrop, the work's opening chapter skilfully combines an analysis of the role of the internet in language learning with a general overview of the situation of language teaching and learning at schools in England, where the number of pupils opting for languages is in decline. In acknowledging the relative complexity that the languages taught at the Faculty of Asian and Middle Eastern Studies can pose for English speakers (p. 13), the authors reiterate the importance of reflective practice and empathy across the whole learning and teaching process, emphasising that the tips offered in the book are based on their own practical pedagogical experiences in preparing syllabi for online tertiary language teaching during the pandemic.

Chapter Two centres on the first tip, which involves using social media into teaching practice and advocates that it should be used as a valuable part of the teacher's toolkit. As such, recognising the challenges faced by teachers and students during the lockdowns, the authors outline a model of hybrid language teaching which mixes traditional approaches with social-media in synchronous and asynchronous contexts. In recognising the importance of social media as a possible language learning aid for today's generation, attention is paid not only to how it can help to enliven the classroom, but also how it can help students acquire the necessary pragmatic competence for certain East Asian languages, as well as for teaching non-standard language including emojis and slang terms. In addition, the chapter discusses how online language tandems can help to mitigate the pandemic-related cancellations of the 'Year Abroad', a feature of most undergraduate modern languages degrees in the United Kingdom where students typically spend the third year of a four-year programme in the country or countries where the relevant languages are spoken (pp. 36-38). All of this information is supplemented by a range of examples, including participant comments from a teaching workshop, excerpts from student feedback, and screenshots from apps.

The focus of the book's third chapter is on the digital diversification of the curriculum. After an overview of the need for diversity-related approaches in contemporary pedagogy, a highly-practical account of the design and implementation of a related case study is given. Within the context of a series of translation classes on hip-hop-related fandom in Japan, information is provided about the linguistic and cultural rationale behind the selection of the tasks (including giving the students an input in this regard), the format of the specific classes, as well as the reception of these lessons by the students. The chapter concludes with a succinct set of pointers useful for those teachers wishing to implement greater curricular diversity in virtual, hybrid, and face-to-face contexts.

The third tip, in Chapter Four, is centred on how educational practitioners can find 'self-generated opportunities' (p. 73) regarding their continuing professional development (CPD), including as teacher-researchers. Noting the challenges posed by the forced shift to online learning, theoretical aspects relating to action research and exploratory practice are detailed, before a case study of a CPD workshop on the topic at the authors' own workplace is given. Subsequently, written feedback from the participants is analysed, noting their own self-reflection on challenges and solutions that may have arisen during the online teaching process.

Assessment is the focal point of the last chapter, and in reiterating the importance of assessment in tertiary education, relevant context is given regarding its rationale and modes as well as to post-assessment debriefing. In the field of online language learning, a series of challenges faced by the move to internet-based assessment are presented, before possible solutions for each point are given. In reframing these situations, it is felt that this may represent a further opportunity for teachers to reflect on their own pedagogical practice.

In recognising the challenges that the move to virtual language teaching may have brought, the subtitle of the Conclusion is "don't lose faith". It brings together the points raised in the book, noting the "largely optimistic view" (p. 128) espoused, and highlighting that the techniques required for success in the online environment are basically already part of a teacher's core competencies. The book is completed by an appendix containing

the questions relating to the CPD workshop in Chapter 3, as well as a list of references, and an index. In addition, a list of further resources is outlined at the end of each of the work's chapters; though this does not generally include lists of suggested apps and other interactive tools, the authors justify this by drawing attention to the ever-changing nature of the internet (p. 11), thus ensuring that the book remains current.

CONCLUSION

As outlined above, this book has many merits. To that, this reviewer would also like to add some additional observations: for example, with regard to relevant aspects such as the digital divide and digital poverty, which could impact the process of teaching and learning languages online. Also, at first glance the information on the British educational context (for example, regarding the learning and teaching of languages as well as on the 'year abroad' for third-year undergraduate students) may seem to be largely irrelevant for an international audience. However, these may provide an interesting point for educators from elsewhere to compare with local approaches in their own countries.

Given that each chapter is well-signposted and clearly structured, additional praise is merited for the book's composition, which means that it is suitable for consultation as required. Indeed, the advice offered in the volume makes it of relevance to a broad audience, including not only experienced language teachers and lecturers, but also those currently in training for the profession at a time when digital competence is not only desired but expected. Accordingly, this book is recommended as a valuable pedagogical resource for language teachers working in virtual, hybrid, and even face-to-face environments.

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