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Navigating learners towards technology-enhanced learning during post COVID-19 semesters

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ABSTRACT

Purpose: In line with the objective of this special issue to unveil the challenges, opportunities, experiences, and perspectives of learners while they engage with technology during the global pandemic especially in a broader context, this study decides to examine their perceptions on the use of technology-based learning environments during the post-covid semesters. This is on the premise that understanding the learners perceptions on using technology for learning after the pandemic unpacks numerous success and challenges which is essential in making propositions that would enhance learners’ digital experience and while steering educational policy to the appropriate direction.

Design: To achieve this, a mixed-method research design was adopted for this study and 36 participants were purposively selected. Semi-structured interview questions and a 5 point Likert-type questionnaire were used to collect information from the participants on their perceptions on using technology-based instruction during the post-pandemic semesters.

Findings: Based on the data that was collected and analyzed, the study unveiled that though technology was perceived to enhance learning among the learners, it significantly creates boredom when used for educational purposes. Other novel findings of this study were instrumental in making valid empirical conclusions on this topic.

Originality: This study adds to the corpus of studies showing learners’ experiences and perspectives on the use of technology for learning during the post-pandemic semester. The study is a starting point for more discussions on the need for developing learner-friendly technologies for better learning experiences among learners.

1. Introduction

The switch from face-to-face teaching to digitally enhanced learning during the recent global crisis required the use of technology by both learners and instructors. Previously, there were notions that various institutes of higher education possessed effective online programs though the numerous reports concerning difficulties of implementing technologically enhanced learning during the recent global crisis suggest the opposite [1,2]. The above studies found that although there are reports that institutions established online distant programs, these programs faced numerous challenges that impedes its effectiveness in producing positive learning outcomes. Already, there are indications in broader literature that teachers and learners experienced several challenges in face-to-face instruction much more in an online learning environment because of their inability to use diverse technological tools [3]. Research acknowledges the use of innovative technology in language teaching in a bid to improve upon the instruction, which has witnessed success and challenges [4,3]. Understanding these challenges and successes are vital in policy and decision making as regards the use of technology by the students. There are enormous studies on the use of technology in pre-pandemic education [5-7] while more studies are emanating on post-pandemic education. It is no longer a debate that there were several difficulties experienced by individuals while using technology. Muchmore, there is evidence to show that teachers and learners required digital literacy to handle technologies used during the pre and post-pandemic semesters [1,8].

On the other hand, inequality in digital literacy across ethnics, countries and individuals continues to loom during the recent global pandemic. While some learners were conversant with the use of technology for teaching and learning, others were lagging in this regard [9, 10]. Also, it is reported that while learners from advanced countries smoothly switched from face-to-face teaching to the use of technological devices for learning, learners from developing and underdeveloped countries were struggling to access technological devices for learning.
For instance, people from rural areas experienced digital social exclusion from telework while providing digital related services within Europe, besides same studies affirms that over 70% of California households have access to internet compared to less than 21% of African households. Moreover, there are evidences to show that learners were more familiar with the use of technology for social networking related activities rather than for educational purposes [13–15]. Utilizing technology for educational purposes during the global crisis was reported as a new learning culture to most learners [16]. More over as earlieron stated, there were suppositions that universities offered online programs, however similar universities experienced difficulty switching from one mode of instructional delivery to another [2]. In view of theseunderstanding the experiences of learners while using technology during the post pandemic semester becomes imminent.

Besides, examining the perspectives of learners and teachers while using technology for learning during the post-pandemic semester would help unveil the experiences of learners and teachers on the role of technology in their lives while learning. Additionally, in line with the objective of this special issue, unveiling learners’ narratives concerning the role of technology during the recent global crisis will help practitioners and instructors to make appropriate decisions and preparation while utilizing technology for teaching and learning in future. Muchmore a search through post-pandemic literature on the use of technologically enhanced learning shows notable studies on this topic with less emphasis on post-pandemic education and fewer studies within this educational context.

It is important to pinpoint that the enormous role of technology in facilitating continuity in educational activities tends to make research on technology and teaching of global importance in recent times. Already, prior studies recognize the role of technology in impacting positive learning outcomes as they found that the use of technology produces positive learning outcomes in a given instruction [17,18]. In addition, more recent authors found an increment in the academic performance of students during the recent pandemic crisis, this positive learning outcome was attributed to improved online learning environment [19]. Recent reports reveal that learners using technological devices for more than 60 min per week achieve higher academic results as compared to others who uses technology for lesser minutes during lessons [20]. Concerning e-learning and education, reports are indicating that 43% of learners find digital technology very helpful in learning, 36% affirm its usefulness in organizing their educational learning activities while 81% uphold that digital technologies play a significant role in boosting their grades [21]. Generally, a view into more recent studies and reports pinpoint that 49% of the learners worldwide have utilized digitally enhanced learning especially during the global pandemic and this re-inforces the important role of technology in education [20].

Furthermore, technology has been successfully designed and implemented in language teaching both for the students and the learners. Some studies show that technology yields positive learning outcomes among language learners [17,22]. Also, recent studies indicate that the use of technology improved the language skills of learners [23,24]. Other studies investigates students’ attitudes while using technology and flipped classrooms and found evidence for positive attitudes of learners while using technology [25,26]. Also, social media tools have played a significant role in improving the language learning performance of students when compared to learners learning language without the use of social media [27], these studies affirm that these technologies are effective for improving language learning among learners using a social media tool. These results present evidence to show the opinions of learners regarding the use of technology during the pre-pandemic semesters.

Recently during the outbreak of the pandemic, there is evidence to show that although it is reported in broader literature the significant role of technology in education, there are technological inequalities across borders, ethnic, and different teaching contexts. While these challenges continue even in post-pandemic education, examining the perspectives of learners concerning the role of technology in teaching and learning during the post-pandemic semester becomes essential. Language instructors have applied technology in language teaching with great success and difficulty. For instance, there are reports in previous language studies to show that instructors perceived the use of technology to be difficult and disengaging sometimes which is usually attributed to fear for the use of technology [18,28]. Besides, recent novel scientific contributions unveiled the likelihood of increase in the number of students disengaging from online learning environment [29]. In recent times, there are calls for digital education for teachers and students on technology integration and use in the classroom [30].

For example, there is evidence from research to suggest that presuming that teachers and learners are proficient users of technology may impede instruction [31]. There are suggestions that school teachers from Taiwan must be taught how to use technology to improve instruction [32]. Moreover, research has emphasized the need for the training of learners and teachers while using augmented reality in the classroom [33]. There are numerous reports on the need for technology literacy among learners and teachers as this has a significant impact on their approach to teaching and learning [34–36]. Furthermore, literature on language teaching provides evidence to indicate the role of teacher development practices in improving technological acceptance and use in online learning Son, 2018; [37]. More so recent studies acknowledge that lengthy online lessons may result in boredom and loss of motivation during lessons, this affects learners and the entire online learning process and technology use as well [38,39]. Understanding learners’ digital literacy level has resulted in the successful design and integration of internet-based applications in language classrooms in some world universities [40,41]. Much more, some notable authors in their recent studies have reiterated that previous studies perceive learners as digitally literate while present studies have debunked this narrative [42]. Overall, there are calls for the use of learner-friendly technologies for classroom teaching [43]. Drawing on these, it seems that understanding the narratives of learners and teachers while using technology for learning in the post-pandemic semester seems an interesting topic that will help analyze different opinions of learner on the role of technology from different perspectives.

Having established these, it is evident that technologies have been used in language teaching and learning with successes and challenges as reported in the aforementioned studies. The aforementioned studies have shown that while technology plays a significant role in language teaching, technology-based teaching may not be without difficulties, especially in post-pandemic education. Much more some notable authors emphasize that understanding the digital life of youths and how to use technology to support and bring about self-fulfillment among themselves is essential [44]. Additionally, researchers acknowledge the role of technology in supporting in promoting engaging learning environments as it is believed that few technological devices have the potential of promoting learners’ interest in various aspects of learning [45].

Given these, examining learners’ experiences and perspectives towards using technology during the post-pandemic semester seems a necessary expedition to engage, as this will help understand learners’ opinions regarding the technologies used and how learner-friendly they were in promoting a good learning experience during the period in review. In line with the objective of this special issue, this study intends to elicit information from learners on their opinions on their experiences of using technology in learning during the post-pandemic semester. Furthermore, research on learners’ perspectives on the use of technology in post-pandemic semesters within this educational context is scarce. This indicates that while there are laudable studies on technology and pre-pandemic education within this educational context, issues concerning learners’ perspectives on the use of technology in post-pandemic education are understudied. Looking at this through the lens of educational research, authors counsel that areas of studies that are under-studied require further investigation to provide more insight on the topic.
Moreover understanding the learner’s opinions on the use of technology in recent times brings us closer to the possible impact of technology on their lives which is part of the objective of this special issue. To achieve this an investigation is imminent to elicit information from learners on their experiences while using technology during the post-pandemic semesters. The following research questions were formulated to guide the study, they are;

1. According to your views, what are your experiences on the use of technology for learning during the post-pandemic semester?
2. What are the perceptions of learners on the use of technology for language learning?

2. Method

2.1. Research design

The study adopted a mixed-method research design that makes use of questionnaires and interviews in eliciting information from participants [48]. This research design was deemed suitable for this study as assists in eliciting information from participants on their opinions regarding the use of technology during the post-pandemic semesters. All students who were taught during the post-pandemic semester were administered a questionnaire at the end of the Fall semester to help elicit information from the student on their opinions while using technology for learning. Additionally, the students were interviewed to share their experiences on using technology for learning purposes.

2.2. Data collection

A questionnaire was used for data collection, it was written in English language and distributed to the participants. The questionnaire consisted of 16 items structured on a Likert-type scale of strongly agree (5) Agree (4) Neutral (3) Disagree (2) Strongly Disagree (1). The items were faced and construct validated by two experts who were language instructors from the faculty of education to ensure that the items and the design of the instrument is in tandem with the aim of the study. This led to changes made in the wording and order of the items. After revising the question items, the final version was used for the study. Afterward, a pilot study was used to determine the reliability of the instrument and the extent to which it answers the questions of the study. A Cronbach’s alpha coefficient of 0.81 was obtained which was within the range of accepted reliability scores [49]. Internal reliability of the scales was also carried out using the inter-item correlation and the values ranging from 0.2 and 0.4 were obtained which was within the acceptable limits [50]. After the piloting, a 16 item questionnaire was used for the study. A Mann-Whitney U test was used to answer the questions across 8 scales with 2 subscale items for each scale. The scales were related to the following areas;

1. Technology is effective and efficient in English as a foreign language (EFL) classrooms
2. Technology-enhanced learning platforms are user-friendly
3. Technology-enhanced platforms make learning interesting
4. Objectives of the lesson are achieved using technology
5. The use of technology enhances good lesson delivery
6. Technology makes language learning easy
7. The use of technology-enhanced classroom participation and interactions
8. Technology-based learning is the best method for language teaching and learning

The participants were asked to indicate their level of agreement with the above-listed items. Informed consent was obtained from the participants before distributing the questionnaires. The objective of the study was explained to the participants before sharing the questionnaires. After answering the question items, questionnaires were collected at a 100% return rate. Also, semi-structured interview questions were used to elicit information from the participants on their experiences while using technology for learning during the post-pandemic semester.

2.3. Participants characteristics

The participants for this study were undergraduate final year English language teaching (ELT) students from a private university in North Cyprus. A purposive sampling method was used to choose the participants for this study. 36 ELT students were recruited for this study. In terms of ethics, written and oral consent was received from the participants before carrying out the study. Concerning the interviews, the participants were coded as A1 to A36 for anonymity purposes.

2.4. Data analysis

The questionnaire was collected and analyzed using SPSS IBM 23.1 version. Also, descriptive statistics were used to indicate the perceptions of the students on the use of technology-based instruction in language teaching and learning. Inferential statistics were used to show the differences in the opinions of the instructors and learners on the use of technology-based platforms for language teaching. The interviews were recorded and analyzed using thematic analysis. Before commencing the interview, the researcher ensured that a restricted amount of information was shared with the interviewees, this was to avoid biased responses from interviewees. Afterward, the data was transcribed while the researcher ensured that all themes were captured as they emerge. After the transcription, the data were re-reviewed by the interviewees to confirm that the transcribed data was a correct representation of their responses. Afterward, the themes were generated, defined, and named. The results are presented and discussed below.

3. Results and discussions

3.1. Interviews

RQ1: According to your views, what are your experiences on the use of technology for learning during the post-pandemic semester?

Table 1 presents a thematic analysis of students’ experiences while using technology for learning during the post-pandemic semester. When the interviewees were requested to share their experiences regarding the use of technology, 4 themes emerged namely; technology enhances language learning, using technology for educational purposes is difficult, excessive use of technology leads to boredom, need for the provision of learner-friendly technology. The themes were related to the perceptions and experiences of learners while using technology during the post-pandemic semester. The themes are discussed below;

3.2. Theme 1: technology enhance language learning

This theme showed that the learners perceived the use of technology-enhanced language learning during the post-pandemic semesters. This theme reflects the comments of most of the participants when interviewed. These are some of the comments that reflect this theme;

Table 1

| Themes | f(%) |
|--------|------|
| Technology enhanced language learning | 11 |
| Using Technology for educational purposes is difficult | 8 |
| Excessive use of technology leads to boredom | 7 |
| Need for the provision of learner-friendly technology | 7 |
When we started learning about technology during the pandemic, I became scared but after the pandemic, I found out that technology facilitates learning (A3).

Language learning is more effective when used with technology...I enjoyed the use of technology for learning during this semester (A16).

Another student adds;

It was so difficult to use technology for learning during the pandemic but it was a better experience using this after the pandemic. I found out that technology helps us to learn better (A27).

Analyzing their responses, it seems that the learners had a positive experience using technology for learning during the post-pandemic semester, though there are insinuations that using technology for educational purposes may be difficult. This is reflected in the next theme.

3.3. Theme 2: using technology for educational purposes is difficult

Through the analysis of the experiences of the participants, the study found that learners consider the use of technology for educational purposes as difficult. Though reasons were not given for this comment, however some of their comments which showcases this theme are presented below;

I love using my laptop for social activities and surfing the net but using the same for lessons was difficult for me (A9).

Usually one may think that switching from using my laptops for watching movies to attending online lessons will be easy but it was difficult to make this switch (A3).

Technology is a good thing but using the same for learning during the previous semester was challenging (A14).

I found it difficult to navigate through the moodle, it was strange to handle (A22).

Though I can be considered tech-savvy, using most technological resources for a lesson was tedious. We relied on the assistance of our teacher (A1).

Another participant further narrates her challenges using technology;

I found out that our textbook became an e-text which was difficult to handle and operate. Most of the lessons were online and activities were assigned to us online. Honestly, it was difficult to do the online exercises. Though the teacher was on standby to give instructions to the students on what to do, it was a challenging experience using that technological tool for learning. (A29)

These comments and many more may be indications that though learners may perceive technology as an effective tool that enhances language learning, using same for educational purposes during the post-pandemic semester was seen as a difficult task.

3.4. Theme 3: excessive use of technology leads to boredom

Furthermore, the learners thought that excessive use of technology may lead to boredom. However, the pre and post-pandemic situation necessitated the need for constant use of technology for teaching. Nonetheless, the learners thought that excessive use of technology created boredom. Below are some of their comments that reflect the theme;

I disliked the online lessons as we stayed for long hours for our online lessons (A29).

Everything changed from face to face to online...students were requested to do something with technology always and this was boring (A25).

I enjoyed the beginning of my lessons but started getting bored when the teacher introduces classroom activities. I like the classroom activities but when everything is based on the use of technology, then the lessons become uninteresting (A18).

Another comment;

From registration of courses to the lessons were tiresome. Technology is good but when used for everything makes life difficult (A11).

I do not like technology when everything is dependent on it. The lessons, assessment, teaching were dependent on the use of technology. This made learning uninteresting (A2).

This theme indicates that the learners thought that excessive use of technology makes learners bored and tired of the online lessons.

3.5. Theme 4: need for the provision of learner-friendly technology

These themes suggest that the learners thought that there is a need to provide learner-friendly educational technologies. This may imply that technologies used for post-pandemic semesters within this educational context were not learner-friendly. These were some of their comments that reflect this theme;

The technology used for teaching was difficult to use and this made lessons difficult to understand (A10).

The lessons were difficult because only the teacher can use the moodle properly. We always ask the teacher for help to use the moodle and other technology...this was not good for learning (A8).

The technologies used for teaching were difficult to handle. I hope the university can provide technologies that are user-friendly for the students (A3).

The students must be considered while making the learning applications. Most times, it was difficult to use these applications for teaching (A22).

These were some of the comments of the interviewees which suggest that they perceive a need for the use of learner-friendly technologies for teaching and learning. Apart from the interviews, the students were administered a questionnaire to elicit information on their perceptions towards using technology for language learning. This is discussed in the tables below;

RQ2: What are the perception of learners on the use of technology for language learning during the post-pandemic semester?

Table 2 presents the descriptive analysis of learners’ perception of the use of technology for teaching during the post-pandemic semester. The results above indicate that learners thought that the use of technology for teaching was efficient and effective in language classrooms, a mean value of 4.66 (3.79) was obtained. Furthermore, the learners thought the technology learning platforms were not user-friendly as a mean value of 1.17 (3.25) was obtained for this item. The results also indicated that the learners thought that the use of technology makes learning interesting, gives room for good lesson delivery, enhances classroom participation/interaction, and thus adjoins the best language teaching method. A mean value response of 4.01 (3.12), 4.05(3.18), 1.19 (3.34), 4.35(3.46), 4.24 (3.85), 4.99 (3.85) was obtained for these scales.

4. Discussion

After careful analysis, the following findings were unveiled; the study found evidence to show that the learners perceived that the use of technology during the post-pandemic education enhanced language learning. This finding is in tandem with the assertions of similar studies which assert that technology plays an important role in producing positive learning outcomes among learners [20,22].

Table 2

Descriptive analysis of learners’ perception of the use of technology for language learning during the post-pandemic semester.

| Scale | N  | Mean | SD  |
|-------|----|------|-----|
| Technology is effective and efficient in EFL classrooms | 36 | 4.66 | 3.79 |
| Technology-enhanced learning platforms are user-friendly | 36 | 1.17 | 3.25 |
| Technology-enhanced platforms make learning interesting | 36 | 4.01 | 3.12 |
| Objectives of the lesson are achieved using technology | 36 | 4.05 | 3.18 |
| The use of technology does not enhance good lesson delivery | 36 | 1.19 | 3.34 |
| Technology makes language learning easy | 36 | 4.35 | 3.46 |
| The use of technology enhances classroom participation and interactions | 36 | 4.24 | 3.85 |
| Technology-based learning is the best method for language teaching and learning | 36 | 4.99 | 3.85 |
the results align with studies that uphold that the use of technology enhances language learning, especially during the recent global crisis [24,25]. Though technology was perceived to enhance language learning, the study found that learners perceive that using technology for educational purposes was difficult. Though the study did indicate reasons for this result, some similar studies have emphasized that learners and teachers may have trouble while using technology for teaching and learning [34,35].

Given these, other studies have reiterated the need for technology literacy as they foresee that this may assist erase difficulties experienced by learners and teachers in using technology for educational purposes [31,36]. Furthermore, the study found evidence to show that learners perceive that excessive use of technology leads to boredom. This result ties well with recent studies on online teaching and learning which counsels that long hours of online lessons should be avoided as they may result in boredom, disengagement from online lessons and loss of motivation among learners [13,29,36,39]. Given these, it was not surprising that the study found that students suggest the need for using learner-friendly technologies for teaching and learning which numerous authors have advised [43].

Furthermore, while analyzing the result of the questionnaire, similar aforementioned result was obtained as learners perceived technology use to enhance language learning which is in tandem with the aforementioned studies. Nonetheless, contrary to the suppositions of studies on technology use in education [6,7], our studies found evidence to show that technology learning platforms were not user-friendly. This reiterates the aforementioned finding where learners recommend the use of learner-friendly technology for teaching and learning. Similar to other studies which affirm that technology makes learning interesting fosters active classroom participation [22,24], the result of our study show that learners perceive technology as effective in enhancing lesson delivery and improving classroom participation

5. Conclusion

This study aimed to examine the perceptions of youth or learners on the use of technology-based instruction during the post-pandemic semesters. After a thorough investigation, the paper concludes by arguing that the preservice teachers perceived the use of technology-based platforms as an efficient approach to language teaching and learning. This further allows the conclusion that during the post-pandemic semesters the youth perceived technology use as a preferable approach to teaching and learning. This conclusion is made given the numerous advantages that come with the use of technology-based tools in learning. The choice of what courses to learn and the convenience, which it brings, make it a better option for the learners.

Additionally, our study found evidence to show that although the technology was perceived to enhance language learning, learners perceive the use of technology for educational purposes as difficult. The only explanation for this phenomenon is the empirical evidence in research reporting on the need for learner and teacher digital literacy to handle technological tools for smooth online lesson delivery. Though reasons were not given and this may be contextual to this educational setting, this study admonishes that integration of technology in the online learning space must be carried out with care and decorum to ensure that the objectives of utilizing technology for learning are achieved.

Furthermore, our study concludes that learners perceive that excessive use of technology creates boredom among learners which in most cases leads to loss of motivation for learning. On this basis, we conclude that while technology may enhance learning, inappropriate use may lead to demotivation among learners which affects the entire online learning process. Be that as it may, we conclude that technology must be used in a way to enhance learning among the learners, while carefully engaging them during online lessons. Interactive technological resources may be useful in eliminating issues of boredom while using technology. Importantly, we summarize by emphasizing that while technology may be useful to the youths and learners, the same must be integrated carefully for educational purposes. Additionally, interactive technologies that engage learners in a meaningful way during online lessons must be used. This study counsels that lengthy online lessons that result in boredom among learners must be avoided to improve online instruction and the use of technology for learning.

However, future investigations are necessary to validate the kinds of conclusions that were drawn from this study. We found that the learner perceives the use of technology for educational purposes as difficult, though clarity is not given on this finding. Future research on this topic might open up possible explanations to the various aspects of difficulty faced by the learner, moreover, there are calls for learner technology education, especially in recent times of global pandemics. We foresee that such investigation may answer these questions and provide solutions to tackling issues of difficulty faced by learners while using technology for educational purposes. Future studies could investigate the phrase “excessive use of technology”. To our understanding, the use of technology during the pre-pandemic semester was the only option to ensure continuity in learning. Defining this essential use of technology for learning especially when the world was without option as excessive may require further investigations. Nonetheless from the findings of our study, it was obvious that though the use of technology was perceived as a good approach to learning, other aspects of technology use need to be addressed to ensure that learners experience optimum satisfaction while using technology in recent times.

Limitations of the study

The major limitation of this study was the small sample size of the participants. The study acknowledges that studies conducted with larger sample size could produce different interesting findings on similar topic. Although, additional statistics from the interviews were used to supplement the data obtained to boost the findings of the study, we foresee that future studies on similar topic must ensure that large participants are recruited to gain robust insight into the investigated phenomena.

Compliance with ethical standards

Disclosure of potential conflicts of interest

The author wish to declare that no conflicting interests exist regarding this study. Also, the author wishes to state that no financial interest exists regarding this publication as no funding was received for this study.

Research involving human participants and/or animals

The authors declare that this study did not inflict or induce any harm on the participants. All participant voluntary declared their willingness to participate throughout the study.

Informed consent

The author wish to declare that oral consent was obtained from the participants before commencing the study. They stated their willingness to participate or withdraw from the study at any given time.

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References
[1] I.M. Gómez-Trigueros, M. Ruíz-Batíulis, D. Ortega-Sánchez, Digital literacy of
teachers in training: Moving from ICTS (information and communication
technologies) to LKTs (learning and knowledge technologies), Educ. Sci. 9 (4)
(2020) 294.
[2] L. Tomczyk, Skills in the area of digital safety as a key component of digital literacy
among teachers, Educ. Inf. Technol. 25 (1) (2020) 471–486.
[3] O. Serhan, Transitioning from face-to-face to remote learning: students’ attitudes
and perceptions of using Zoom during COVID-19 pandemic, Int. J. Technol. Educ.
Sci. 4 (4) (2020) 335–342.
[4] M. Webb, E. Domon, Impacts of flipped classrooms on learner attitudes towards
technology-enhanced learning environment, Comput. Assist. Lang. Learn. 33 (3)
(2020) 240–274.
[5] S. Peregy, O. Boyle. Reading, writing and learning in ESL: A resource book for
teachers, Allyn & Bacon, New York, 2012.
[6] J.M. Spitzer, R. Gutsfeld, M. Wirzberger, K. Moeller, Evaluating students’
engagement with an online learning environment during and after COVID-19
related school closures: a survival analysis approach, Trends Neurosci. Educ. 25
(2021), 100168.
[7] D. Marshall, Evaluating the TESOL technology standards for teachers: integration
and adaptation, CALICO J. 38 (2021) (3).
[8] M. Webb, R. Domon, Impacts of flipped classrooms on learner attitudes towards
technology-enhanced learning environment, Comput. Assist. Lang. Learn. 33 (3)
(2020) 240–274.
[9] P. Hubbard, Revisiting the TESOL technology standards for teachers: integration
and adaptation, CALICO J. 38 (2021) (3).
[10] W. Lam, Technophobia vs. technophobia: A preliminary look at why second-
language teachers do or do not use technology in their classrooms, Can. Mod. Lang.
Rev. 56 (3) (2000) 389–420.
[11] M.W.H. Spitzer, R. Gutuzfeld, M. Wirberger, K. Moeller, Evaluating students’
engagement with an online learning environment during and after COVID-19
related school closures: a survival analysis approach, Trends Neurosci. Educ. 25
(2021), 100168.
[12] D. Marshall, L. Ward, Let’s collaborate! technology, literacy, and teaching during a
pandemic, Technol. Educ. Teach. 80 (1) (2020) 30–31.
[13] F. Mufid, A.A. Hanum, A. Fadhilah, Preliminary research in the development of
mathematics discipline
[14] T. Rehman, Skills in the area of digital safety as a key component of digital literacy
among teachers, Educ. Inf. Technol. 25 (1) (2020) 471–486.
[15] E. Domon, Impacts of flipped classrooms on learner attitudes towards
technology-enhanced learning environment, Comput. Assist. Lang. Learn. 33 (3)
(2020) 240–274.
[16] C. James, K. Davis, L. Charmaraman, S. Konrath, P. Slovak, E. Weinstein, L. Yarosh,
‘Inspiration, ideas, encouragement
[17] S. Arora, A. Singh, A. Verma, A. Khandelwal, COVID-19 the earliest for digital learning in
mathematics: an overview from technology literacy, J. Phys. Conf. Ser. 1819 (2021),
012027.
[18] N. Ratmanishig, K. Ni Mah, H. Hidayat, COVID-19 the earliest for digital learning in
mathematics: an overview from technology literacy, J. Phys. Conf. Ser. 1819 (2021),
012027.
[19] K. Borthwick, A. Gallacher-Brett, ‘Inspiration, ideas, encouragement
[20] D. Marshall, R. Ward, Let’s collaborate! technology, literacy, and teaching during a
pandemic, Technol. Educ. Teach. 80 (1) (2020) 30–31.
[21] A. Anadolu, A. Gürdal, COVID-19 the earliest for digital learning in
mathematics: an overview from technology literacy, J. Phys. Conf. Ser. 1819 (2021),
012027.
[22] N. Ratmanishig, K. Ni Mah, H. Hidayat, COVID-19 the earliest for digital learning in
mathematics: an overview from technology literacy, J. Phys. Conf. Ser. 1819 (2021),
012027.
[23] K. Borthwick, A. Gallacher-Brett, ‘Inspiration, ideas, encouragement
[24] D. Marshall, L. Ward, Let’s collaborate! technology, literacy, and teaching during a
pandemic, Technol. Educ. Teach. 80 (1) (2020) 30–31.
[25] F. Mufid, A.A. Hanum, A. Fadhilah, Preliminary research in the development of
mathematics discipline
[26] T. Rehman, Skills in the area of digital safety as a key component of digital literacy
among teachers, Educ. Inf. Technol. 25 (1) (2020) 471–486.
[27] E. Domon, Impacts of flipped classrooms on learner attitudes towards
technology-enhanced learning environment, Comput. Assist. Lang. Learn. 33 (3)
(2020) 240–274.
[28] C. James, K. Davis, L. Charmaraman, S. Konrath, P. Slovak, E. Weinstein, L. Yarosh,
‘Inspiration, ideas, encouragement
[29] S. Arora, A. Singh, A. Verma, A. Khandelwal, COVID-19 the earliest for digital learning in
mathematics: an overview from technology literacy, J. Phys. Conf. Ser. 1819 (2021),
012027.
[30] K. Borthwick, A. Gallacher-Brett, ‘Inspiration, ideas, encouragement
[31] D. Marshall, L. Ward, Let’s collaborate! technology, literacy, and teaching during a
pandemic, Technol. Educ. Teach. 80 (1) (2020) 30–31.
[32] A. Anadolu, A. Gürdal, COVID-19 the earliest for digital learning in
mathematics: an overview from technology literacy, J. Phys. Conf. Ser. 1819 (2021),
012027.
[33] K. Borthwick, A. Gallacher-Brett, ‘Inspiration, ideas, encouragement
[34] D. Marshall, L. Ward, Let’s collaborate! technology, literacy, and teaching during a
pandemic, Technol. Educ. Teach. 80 (1) (2020) 30–31.
[48] T.R. Black. Doing quantitative research in the social sciences: An integrated approach to research design, measurement and statistics, sage, 1999.

[49] A. Tashakkori, C. Teddlie. Handbook of Mixed Methods in Social & Behavioral Research, SAGE Publications, Thousand Oaks, CA, 2003.

[50] J.W. Creswell, J. Creswell. Research design, Sage publications, Thousand Oaks, CA, 2003.