THE DEGREE OF CONFORMITY OF PEDAGOGICAL ACCOMPANIMENT AND DIGITAL CONTENT TO THE QUALITY OF SELF-ENGAGEMENT AND SELF-AWARENESS

Maroua Rogti, Ecole Normale Supérieure de Laghouat, Algeria

ABSTRACT

The recent technological advances have had a profound effect on worldwide higher education, and educators and students needed to make abrupt changes to adjust to a remote learning environment that integrated information technologies and digital learning. Based on the Self-determination Theory, this study was undertaken with a sample of 150 English as Foreign Language students, and a sample of 12 teachers of English at Teachers' College of Laghouat, Algeria. Using a convergent online survey, the study measured the level of the students' digital self-engagement within a Technological Pedagogical Content Knowledge framework. The students were queried about their digital self-engagement, while teachers were surveyed about their perception of TPACK. The analysis was performed using descriptive statistics and Exploratory Factor Analysis. Results showed that teaching and learning through digital content was an efficient remote educational experience that reflects high levels of student self-engagement and teacher self-awareness.

Keywords: *remote education; TPACK; self-awareness; digital self-engagement; professional growth*

INTRODUCTION

Technology is empowering students all over the world with the creation of knowledge and multimodal learning. Students can democratize knowledge through multimedia tools that have become vital for the curriculum content and provide students with free access to valuable courses, information sources, and experts. Furthermore, the integration of computer literacy with education provides English as a Foreign Language (EFL) students with the opportunity to use the target language in meaningful ways and in authentic situations, especially in engaging in innovative, interactive, and communicative-based tasks.

A lack of experience with e-learning and the often-low quality of the lessons posted by some teachers, in addition to the unavailability of digital tools and internet access for some students, have been serious challenges to students in their learning. Wheelihan (2011) states that achieving successful learning outcomes in a digital learning environment requires creativity and innovation, and students and teachers can actively create and construct knowledge through interactive media. Occasionally, new pedagogical practices and learning resources manage to make considerable use of technology. According to Lemke et al. (2009), technology is allowing students to construct knowledge through multimodal learning. Technologies have been developed to be applicable to a wide range of curriculum areas, thus enabling the development and integration within curricula of 21st century skills such as creativity, cooperation, and communication.

The current study can be contextualized within the frame of how technological advances affected students' motivation and academic performance. This study aims at diagnosing the effects of technology use on the self-regulation and self-engagement of students in a digital learning environment. It also aims at investigating the teachers' level of satisfaction and self-awareness towards using TPACK framework in their EFL classrooms. Hence, we attempted to identify and measure the development of students' digital self-engagement when performing a task online and teachers' self-awareness about the TPACK framework along with their use of technology, pedagogical methods, and content knowledge. Focusing on the main problem of the research, we asked the following questions:

- Is there any significant impact on developing the level of EFL students' digital self-engagement in an online learning environment?
- Is there any significant impact on increasing teachers' level of self-awareness about using the TPACK framework in a digital learning classroom?

Subsequently, we raised the following hypotheses:

H1: There is a significant impact on developing the level of EFL students' self-engagement in an online learning environment.

H2: There is a significant impact on increasing teachers' level of self-awareness about using the TPACK framework in a digital learning classroom.

H0: There is no significant impact on developing the level of EFL students' self-engagement, and there is no significant impact on teachers' level of self-awareness about using the TPACK framework in a digital learning environment.

We assume that appropriate pedagogical methods can typically lead to self-regulated learning in performing a language task within an online learning environment. Further, learners who are exposed to appropriate pedagogical tools, appropriate subject content, and efficient technological devices are more likely to be self-engaged and self-regulated while studying online.

Therefore, an awareness of the digital learning process will provide authentic learning and a high level of response towards learning and performing a language. Also, building the digital readiness of the learners, which requires making choices, setting goals, solving problems, monitoring, and self-evaluating the learning progress, is significantly based on an interaction between teachers' self-reflection and self-awareness about the TPACK framework in an online language course and their digital competence.

DIGITAL COURSE DELIVERY SYSTEMS

Technology-based learning that involves multimedia and ICT tools has emerged as the most attainable database of information to allow interaction among and acquiring and sharing knowledge with people at all levels (Mat Dawi et al., 2016). The first online educational program came into usage in 1989 at University of Phoenix by using CompuServe, one of the first online services. Online schooling programs via the internet emerged after the World Wide Web appeared in 1993 (Shelton & Saltsman, 2005).

Wildana et al. (2020) stated that online learning can be effective as it facilitates the use of effective platforms. Online education is defined as distance education that uses computers and the internet as the delivery mechanism, with at least 80% of the content material delivered online (Allen & Seaman, 2008). Online learning is the best way to ensure the continuity of students' learning and ensure interactivity (Ariffin et al., 2020).

Indeed, e-learning can be a network used in formal teaching through which information can be sent via electronic resources to a particular audience. These multimedia tools may involve webcasts, podcasts, YouTube videos and TED Talks, and multiple websites (Chapelle, 2001). Warschauer (1996) stated that "CALL activities were no longer limited to interaction with the computer and with other students in the class but included communication with learners in other parts of the world" (p. 23).

The network may incorporate elements that can guarantee the work of such systems, including computers and the internet (Suresh Babu & Sridevi, 2018), and these elements involve technological devices and design, electronic platforms and content, and users (Cohen & Nycz, 2006). Having access to online courses in English, satisfactory learning outcomes can be achieved due to the development of these technological devices and use of

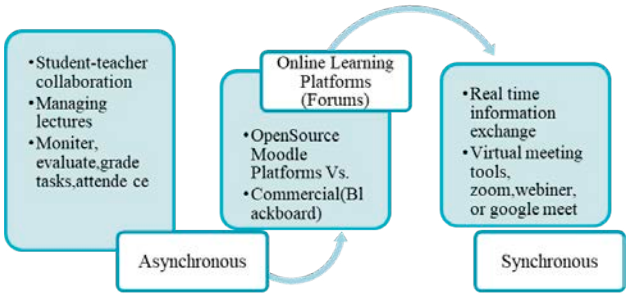
online platforms (Harrison & McTavish, 2018).

Distance education ensures greater experience and stabilizes the use of time and technology based on the ability of students to self-regulate (Wildana et al., 2020). Mehrotra et al. (2001) stated that distance education is "a current reality creating opportunities and challenges for educational institutions; a reality offering students expanded choices in where, when, how, and from whom they learn; a reality making education accessible to ever larger numbers of persons" (p. 6).

This can be seen through the increase of distance education courses and the high interest of teachers teaching and students applying for these online courses. The use of online programs and tasks grew, as did the development of online interactions between students and teachers (Kör et al., 2016; Reiser & Dempsey, 2012), as distance learning emphasizes the teacher's and the students' knowledge of the content of the learning and the communication system in the learning process (Moore, 1990).

Students need to be aware of multimedia and technological tools and have digital engagement to learn computer programs and software and use them for educational and academic purposes (Rahman, 2005). Among the useful e-learning platforms is Google Drive, which is a free cloud-based storage service that syncs papers, photos, and other files across all of the user's devices, including smartphones, tablets, and computers (Anderson & Dron, 2011). Moodle, Modular Object-Oriented Dynamic Learning Environment, is an online educational platform with an open source LMS that supplies a personalized learning environment to all its users. Educators can use Moodle to create learning content, manipulate it, and interact with teachers and students.

Figure 1. Learning Management Systems (LMSs) Forums (Jeong, 2017)



Online learning platforms may involve practices for communication and interaction such as web meetings, which involve video and audio, and written communication that involves sending and receiving responses in real time (Cacheiro-Gonzalez et al., 2019). Occasionally, an LMS is software that involves a set of services to help educators manage their online courses and monitor, evaluate, and grade students. It may further include other pedagogical required for the teaching and learning processes (Ninoriya et al., 2011; Ouadoud, 2018).

LMSs can be categorized into open-source, Moodle platforms and proprietary platforms such as Blackboards. Both are well established distance learning platforms created to expedite student-teacher interactions based on a question-response framework not limited by time (Janghorban et al., 2014). Further, concurrent online education courses that require information interchange are usually managed through visual platforms such as Zoom and Google Meet (Moorhouse & Kohnke, 2021).

A virtual campus model has developed that can foreground software and hardware designs, course registration, academic resources establishment, and virtual courses. The configuration must include data about the institution, and it must be well established and accessible for students (Jeong, 2017). Users must be engaged with the classroom design, which must be instinctual to use. The users' interactions must occur through the inclusion of information within the LMS platform, which can enable them to have regular and consistent access to content (Chanprasitchai & Khlaisang, 2016). In addition, the configuration of academic resources requires the use of metadata, including name, title, and institution, by relating it to learning objects.

Moodle is an online flexible learning environment that allows web-based communication between users (Benta et al., 2014). This online platform can allow users or educators to provide students with input and academic resources that they may not receive during their usual classroom courses, and students can easily acquire and share information and receive feedback (Martín-Blas & Serrano-Fernández, 2009). Moodle includes options like chatting and private messaging, and it can be managed as another useful method of teaching along with the traditional classroom (Oproiu, 2015).

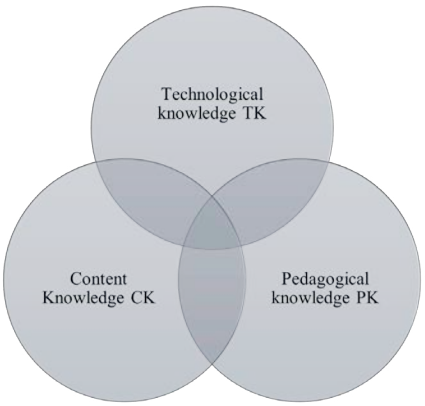
Table 1. Classroom Configuration Model for LMSs (Chanprasitchai & Khlaisang, 2016)

LMSs Configuration			**Construction Resources**
Course data:	Learning tools	Server	Connectivity
Name, semester	online libraries	Transmission	Web, internet
Style configuration		Access point	LMSs platform
Inspiration			Mobile app
Access code			HTTPS
Registry courses	**Academic resources**	**Hardware**	**Software**

Technological Pedagogical Content Knowledge (TPACK)

Technology, content, and pedagogy may have a systematic relationship (Keating & Evans, 2001; Zhao, 2003). This can be understood through the TPACK framework, which comes from Shulman's Pedagogical Content Knowledge (PCK) notion through which technological knowledge is situated within content and pedagogical knowledge. TPACK is a framework that establishes the relationships and complexities among the major components of knowledge including technology, pedagogy, and content (Mishra & Koehler, 2006). This framework aims at evaluating teacher knowledge and emphasizes students' learning in multiple content areas. It is efficient for considering integrating technology into teaching and developing knowledge by teachers. TPACK as a framework can effectively measure teaching knowledge and yet affect the training and professional development experiences for educators in higher educational institutions (Archambault & Barnett, 2010).

Figure 2. Technological Pedagogical Content Knowledge (TPACK)



TPACK

TPACK's interrelated components are knowledge, pedagogy, content, and technology, as illustrated in Figure 2. Pedagogy often indicates the teacher centered approach to teaching students and is opposed to adult learning principles established in andragogy, which theoretically demands the permissive pledge of learners to explore the substantial utility of knowledge. The basic components of the TPACK framework are as follows:

- Technology Knowledge (TK) refers to the knowledge about various technologies, ranging from low-tech to digital technology, and involves the internet, whiteboards, and software programs.
- Content Knowledge (CK) refers to knowledge about the learned and taught subject matter (Mishra & Koehler, 2006). It involves the content being taught because the nature of content knowledge requires different content areas.
- Pedagogical Knowledge (PK) involves the teaching approaches and knowledge in management strategies, assessment, lesson planning, and learning experiences.
- Pedagogical Content Knowledge (PCK) refers to the content knowledge that is related to the teaching process (Shulman, 1986). It involves different content areas and integrates both content and pedagogy to ensure efficient teaching activities in the content areas.
- Technological Content Knowledge (TCK) involves the knowledge of how technology can represent a particular content. It is about using a particular technology based on the content area.
- Technological Pedagogical Knowledge (TPK) refers to the knowledge of how different technologies can be integrated in teaching and to the way technology may change the method of teaching.

- Technological Pedagogical Content Knowledge (TPACK) is about the knowledge teachers can have for integrating technology into their teaching in various content areas.

Educators should therefore have knowledge about the intricate interaction between the three components of knowledge (CK, PK, TK) by teaching content through implementing suitable pedagogical methods and teaching technologies.

Digital Self and Self-Determination Theory (SDT)

Distance education is a type of learning in which the learner is physically separated from the teacher and involves a planned and a guided learning experience. It brings together the physically distant student and teacher of the learning content with planned and structured learning experiences that allow interactions between the two (Saykılı, 2018). Ultimately, Holmberg (1989) stated that:

> Distance education is a concept that covers the learning-teaching activities in the cognitive and/or psycho-motor and affective domains of an individual learner and a supporting organization. It is characterized by noncontiguous communication and can be carried out anywhere and at any time, which makes it attractive to adults with professional and social commitments (p. 168).

Distance education has been mediated by the use of technology, especially digital technology that encourages communication and interaction opportunities during learning. These technologies made the shift from methodological and didactic teaching to socially constructing knowledge (cited in Saykılı, 2018), which is under the lens of the social constructivist approach. There has been a shift from a cognitive, rational, and behaviorist learning context to a lifelong, continuous, and constructivist learning context that emphasizes more autonomy and independent learning. Learner autonomy is a fundamental issue in distance education. Distance education therefore requires interaction and communication for students by exposing them to online courses and allowing them to be self-regulated and autonomous in a web-based learning environment (Anderson & Dron, 2011).

On the basis of independence in learning and autonomy of learning, a theory about both intrinsic and extrinsic motivations has appeared recently, which is Self-Determination Theory (SDT), a theory of human motivation that has been implemented in diverse fields to explore the adaptability of social and environmental factors on motivation. According to this theory, every individual has an intrinsic need to be autonomous in their learning setting (Deci & Ryan, 2011). Self-determination theory has been emphasized by Firat (2016) as a basic concept in online learning motivation.

SDT categorizes motivation into intrinsic motivation, which involves innate reasons like attention or enjoyment, and extrinsic motivation, which is about doing something for reasons like a reward or avoiding punishment (Deci et al., 2017). SDT attempts to ensure the basic psychological needs, autonomy, competence, and relatedness for the nourishment of students' autonomous motivation, optimal functioning, and high-quality performance (Deci & Ryan, 2000).

On the other hand, Lynch and Dembo (2004) identified five components of learner autonomy that are vital for distance education, including self-efficacy, internet self-efficacy, time management, learning environment management, and learning assistance management. Arnold (2006) suggested autonomy aspects can enhance the learning environment, such as learning facilitation, self-selection, lack of face-to-face interaction, media choices, peer learning and dialogue, peer review, negotiated learning activities, self-evaluation, performance evaluation, flexible access, and self-reflection.

METHOD

This study examines how students and teachers can use and respond to using technological pedagogical content knowledge (TPACK) throughout their online teaching classrooms. As part of this research plan, we constructed the Survey of Teachers' Knowledge of Teaching and Technology to collect data on their self-reflection of the proposed knowledge fields within the TPACK framework. Also, a survey was sent to 150 students to measure their level of digital self-engagement and language performance through their online courses via Moodle platform and within the TPACK framework. The online survey started during, and after the end of the online learning period during the academic year 2020/2021.

On May 24th, 2021, participants were contacted via email to complete the survey and were given a deadline for June 7th, 2021. The population comprised of 150 students who came from different levels

including second-, third-, and fourth-year levels at the department of English at Teachers' College of Laghouat. During the period of data collection, students were studying in groups, with one group of each level studying online through Moodle platform and another group of each level studying in the physical classroom. Due to the novelty of the Covid-19, we attempted to adapt particular items to address the research problem and worked on ensuring their content validity.

The Survey of Teachers' Knowledge of Teaching and Technology was then administered online after students completed at least three online courses designed by their teachers. We also collected data for this survey from 85 students who responded prior to their instructional technological courses through Moodle. These online courses aimed at using technological skills and devices and technology-based learning environment integrating all content knowledge areas. The teachers designed their instructional technology courses using TPACK as an organizing framework for course content and tasks.

To carry out this study, a research instrument was used comprised of 38 items with a Likert-type response scale from 1 to 5 for *strongly disagree* to *strongly agree*. We applied statistical procedures to check if the instrument-maintained reliability and validity of the results. We performed a Cronbach's Alpha procedure to test reliability and obtained a value of 0.657. For the validity of the instrument, an exploratory factor matrix analysis EFA was incorporated.

DATA ANALYSIS

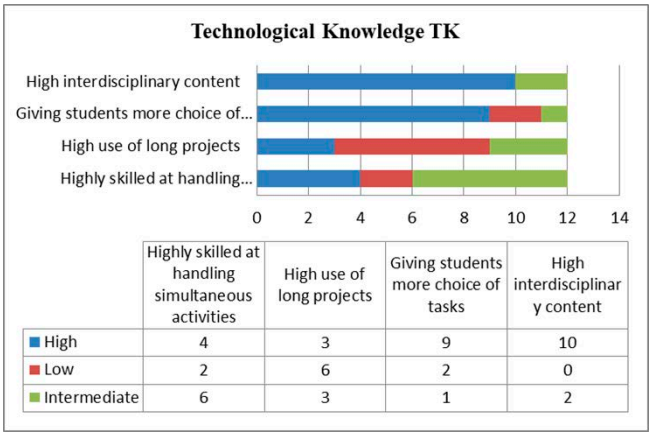
Teachers worldwide had to adapt to online teaching practically unexpectedly due to the COVID-19 pandemic. Throughout this study, we could see that most educationalists saw distance learning as a provisional solution, while those who held an appreciative attitude toward online teaching were expected to adapt more of their teaching methods and materials in the wake of the pandemic. The rate of corresponding participants who responded to the survey was 87% of those to whom the survey was sent. The survey involved structured, close-ended questions designed to identify the participants' (teachers and students) pedagogical knowledge, self-engagement, and digital experience with using Moodle for teaching and learning. The items and scales for the students' survey that we used for this study rated from 1 to 5 for *strongly disagree* to *strongly agree.*

Teachers' Level of Technological Knowledge

The field of technological knowledge (TK) is a component of TPACK that is about the perceptions and understanding of how to use diverse technologies. The participant teachers were queried about their technology knowledge and the technological skills they used during their online classes. Most teachers feel well prepared but had difficulties preparing themselves sufficiently in advance for online learning.

Most teachers (n = 6) are highly skilled at handling multiple activities and tasks online, while a low number of teachers (n = 3) argued that they do not use long projects. A high number (n = 9) admitted that they give students more choice of tasks. A majority of teachers (n = 10) stated that they are familiar with the content of the subject they teach, as seen in Figure 3.

Figure 3. Teachers Adopted Technological Skills



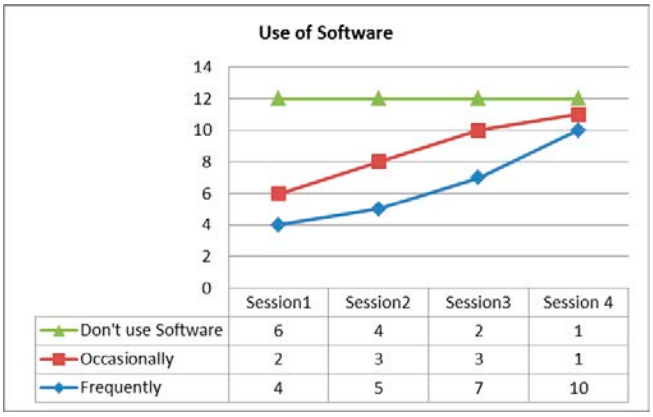
	Highly skilled at handling simultaneous activities	High use of long projects	Giving students more choice of tasks	High interdisciplinary content
High	4	3	9	10
Low	2	6	2	0
Intermediate	6	3	1	2

Teachers were asked whether they used software in their online teaching during the four sessions of online courses. Four (n = 4) teachers agreed that they frequently use software in the first session and most of them (n = 10) use software in their online classroom. Only one teacher (n = 1) occasionally uses software, and one (n = 1) did not use software in their online courses (see Figure 4).

Teachers' Perceptions of Understanding Content Knowledge

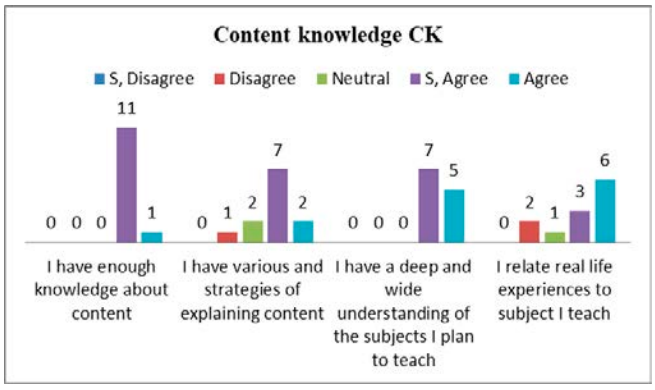
Content Knowledge (CK) involves the teachers' knowledge about the subject and content they are teaching, as this knowledge differs according to different content fields and subjects. Most agreed (n = 11) that online learning was well-structured and

Figure 4. Teachers Use of Software



their level of content knowledge was high. Also, a majority of teachers (n = 7) claimed that they are aware of multiple strategies for explaining content for students, and some (n = 7) understand the content of the subjects they teach. While only a few (n = 3) strongly agreed that they relate real life experiences to the subjects they teach (see Figure 5).

Figure 5. Teachers Perceptions of Content Knowledge



Regarding the answers of teachers on the survey, Figure 6 shows that most of them (n = 7) were aware about how their students learn, some (n = 5) said they can use appropriate teaching methods, and a few (n = 4) stated that they encouraged collaborative learning through Constructivist approaches. A majority (n = 5) asserted that they were able to plan a course to promote student digital self-engagement.

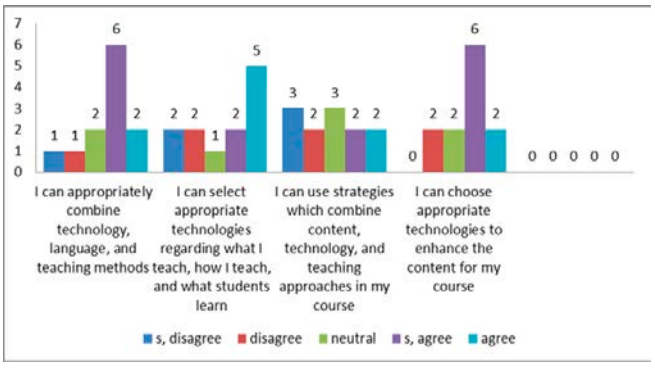
Teachers' Awareness of TPACK

Technological Content Knowledge (TCK) involves teachers' awareness of using a particular technology and refers to the technological skills learners may be aware of to understand and perceive concepts in a particular content field, while Technological Pedagogical Knowledge (TPK) involves teachers' knowledge of how implementing different technologies in their teaching and accompanying technological devices with pedagogical tools of teaching.

Technological Pedagogical Content Knowledge (TPACK) incorporates the independent variables of the study and necessitates teachers' knowledge for integrating technology into their classrooms. Teachers need to use appropriate pedagogical tools and methods and have knowledge of particular technological devices to teach content. They should be aware about integrating the main components of knowledge, Content Knowledge, Pedagogical Knowledge, and Technological Knowledge.

Based on the teachers' answers regarding their awareness about teaching language, technology use, and teaching methods, most (n = 6) stated that they can appropriately combine technology and teaching language methods. Some (n = 5) agreed that they can select appropriate technologies for running their online courses, while the majority (n = 6) strongly agreed that they can choose appropriate technologies to enhance the content for their courses.

Figure 6. Teachers' Self-Awareness about Using TPACK



To ascertain the answers of the teachers about their awareness of TPACK, their answers were interpreted through factor matrix, which is seen in Table 2.

The second aim of the study was to develop a valid and reliable scale that could be used to determine the digital self-engagement of distance education students in e-learning environments. To this end, for the validity analysis of the data, we

Table 2. Teachers' Factor Scores for TPACK Students' Digital Self-Engagement

Technological pedagogical Content Knowledge	Factor matrix 1	Factor matrix 2
a. I can appropriately combine technology, language, and teaching methods	0.707	0.010
b. I can select appropriate technologies regarding what I teach, how I teach, and what students learn	0.606	0.101
c. I can use strategies which combine content, technology, and teaching approaches	0.569	-0.051
d. I can choose appropriate technologies to enhance the content for my course	0.551	-0.104
Cronbach's Alpha	0.727	0.657

used a Likert scale to measure the students' level of digital self-regulation, evaluate their perception of online courses and tasks, and measure their self-engagement within the e-learning environments.

A total of 120 students out of 150 completed the questionnaire, which represented a response rate of 85%. Of the 120 students, 90% participated in all the online learning courses and 10% stated that they participated in the majority of courses. The participants assessed the aspects of handling multiple activities and tasks online. To investigate the participants' perceptions and assessment of ongoing online learning, seven items were measured with a 5-point Likert scale from 1 to 5 for *strongly disagree* to *strongly agree*. The last variable involves students' assessment of online learning and the level of their satisfaction with online courses. Mean and SD for these are provided in Table 3.

We used descriptive statistics to analyze the students' scores on the Likert scale, revealing that a large number of students had a high satisfaction with distance learning. The standard average mean score on the scale is (M = 3.84, 1.03). This finding indicates that the students who participated in the study had a high level of digital self-engagement and self-reflection in the digital learning setting and the average scores of the students who performed their courses on e-learning Moodle platform were high.

To ascertain students' digital self-regulation during their online courses, the results show that a majority (n = 72) agreed that they learned to work independently, (n = 75) agreed that they learned to collaborate, (n = 55) agreed that they used computer skills, but only half of the sample (n = 60) agreed that they were communicating electronically.

Regarding the answers of students about their digital self-engagement, a large majority (n = 67) strongly agreed that they choose their own learning strategy, (n = 36) strongly agreed that they can set their own digital learning goals, while only (n = 32) strongly disagreed about that. A good number of students (n = 42) strongly agreed that they

Figure 7. Students' Digital Self-Regulated Learning

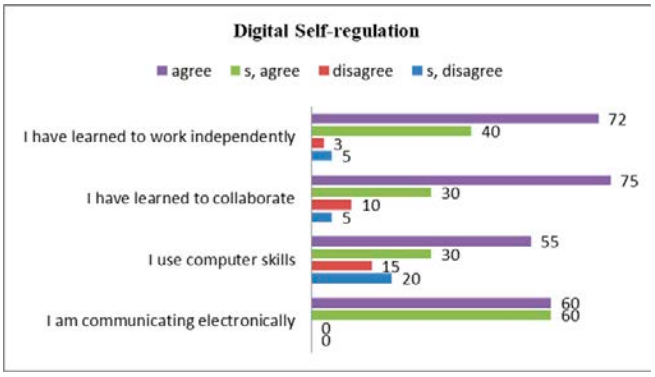
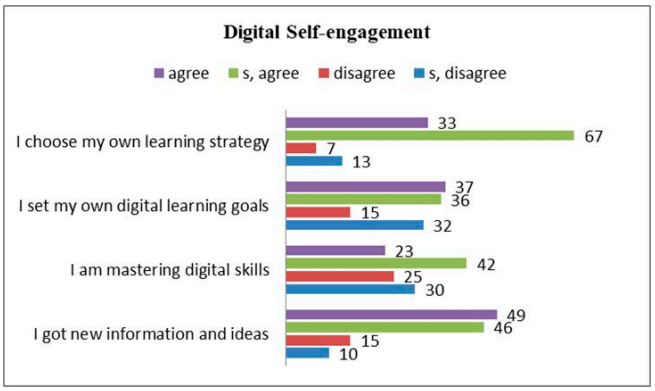


Figure 8. Students' Digital Self-engagement



master digital skills, while a good number (n = 49) agreed and (n = 46) strongly agreed that they got new information and ideas along with their online learning experience.

Students evaluated teachers as highly responsible (Mean = 4.23), as they considered the support and service of platforms to be sufficient (Mean = 3.74) The Cronbach's Alpha of the six items was 0.97, indicating a high internal consistency for the composite evaluation score. We used the composite

Table 3. Students' Factor Loadings on Perceptions of Progressive Learning Courses

Perceptions	Mean	Standard deviation
a. Moodle platform support is	3.74	1.15
b. Teachers take responsibility for students learning	4.23	0.94
c. The online courses are well prepared	3.95	1.05
d. Interactive feedback and question answering are effective	3.81	1.08
e. Teaching methods are clear and reasonable, and online learning resources are sufficient	3.98	1.04
f. Level of satisfaction with progressive online learning	3.84	1.03
Cronbach's Alpha	**α = 0.97**	

evaluation as a continuous variable in the following regression analysis. As is shown in Table 3, there was a moderate level of satisfaction with the ongoing online education (Mean = 3.84).

Possible responses: 1 = *strongly disagree*; 2 = *disagree*; 3 = *neutral*; 4 = *agree*; 5 = *strongly agree*; M=mean, SD=standard deviation, N=number of valid answers (total =120)

Throughout the regression analysis, we merged *agree* (Likert score 4) and *strongly agree* (Likert score 5) into one category with a value of 1 (51%) and merged *strongly disagree* (Likert score 1), *disagree* (Likert score 2) and *neutral* (Likert score 3) into a single category with a value of 0 (26%).

DISCUSSION

Prior to evaluating the level of TPACK demonstrated in the teachers' online classrooms, we attempted to investigate how scores on the TPACK instrument prove the teachers' self-reflection and pedagogical practice about their technological knowledge. The research instrument was reliable for measuring teachers' self-awareness about Technological Knowledge, which involves their technology skills, their access to technology, and its use during their online courses. Regarding the teachers' answers, they reported regular access to technology and software use between the first and the last online courses, although the analysis revealed that this did not signify the whole remote online learning experience of teachers.

The analyses revealed a statistically significant interaction between teachers' self-awareness and competence; thus Hypothesis 2 is proven. The majority of teachers agreed that the TPACK framework was efficient, and they were self-aware and well prepared for online courses.

This finding is deeply related to the related literature even though some practical tasks need a dialogic interaction between the teacher and students. Therefore, in the humanities, there might not be a difficulty in readiness to teach online, which was proven through the answers of most teachers and their self-evaluation of the digital teaching process. The results of the analysis are largely consistent across the investigation and showed that although the majority of teachers (70%) were not experienced in online teaching and did not have technological skills before the Covid-19 pandemic, they adjusted very quickly to digital teaching and their pedagogical and content knowledge acquisition through their engagement in online learning was increasing very quickly. According to the findings, most teachers (80%) were aware using appropriate teaching methods and integrating them with technology use.

Yet, the teachers were aware about the content of the subject they teach and were able to plan, set objectives, and structure an online course in the field of English language teaching. The results are further supported by the identified scalar measurement invariance, affirming that the level and variance of teachers' self-awareness about using and incorporating TPACK is high with a Cronbach' Alpha (α) variance of (α = 0.727, 0.657). These findings are unexpected since most teachers have not yet adjusted to the new method of teaching, are not well prepared and ready for technological use, and are not all aware about using online pedagogical teaching methods.

Most students agreed that perceiving regular access to a suitable learning environment and

the use of Moodle platform was sufficient (M = 3.74), which serve as a significant predictor of the remote learning experience. Thus, Hypothesis 1 is approved. Teachers' responsibility for students' learning, including their reflective practice on their own teaching, interactive feedback and questioning, effective use of pedagogical methods, and online learning resources, also serve as major aspects of the study. Indeed, the findings of these aspects reveal the students' level of satisfaction with progressive online learning.

Although most students prefer studying at university or on campus, most experienced efficiency in the remote environment due to saving time and the sufficiency of the Moodle platform. Students' digital self-engagement is affirmed through their motivation and satisfaction with the online learning process. This includes the teachers' use of appropriate technological devices and pedagogical tools and their awareness about the content of the subjects they teach. The findings proved that most students faced fewer challenges in their learning and that their remote education experience was efficient. This may imply that their experience can be relevant as education develops through applying lessons learned during the pandemic.

LIMITATIONS

Despite the considerable number of participants in the sample and the high percentage of illustrated variance, the study is limited in its scope. The study presented only evocative findings limiting their generalization to a wider population. The findings are based on self-reports, which are valid in evaluating and measuring students' digital self-regulation and assessing teachers' awareness about using TPACK, although data were collected online and the sample was self-selected and informants could not be guided. In addition, the cross-sectional design is a limitation for building occasional deductions and reasoning, as the study does not afford evidence for causal outcomes.

Also, due to the anonymous structure of the linear data, we could not control the multiple dimensions and aspects of the data, such as the learning environment, to point out possible potential context outcomes. Indeed, this study might not serve as a crucial case to interpret the role of digitalization in remote education and the efficient use of the TPACK frame to promote digital self-engagement in learning during the Covid-19 pandemic. This study did not examine students' impartial proximity to technology and digital devices regarding the digital split during the pandemic, which is as possible field for further research.

CONCLUSION

The current study investigated the effect of the digital learning experience on teachers' awareness about using TPACK and on students' digital self-engagement. To achieve the aims of the study, two Likert scales were developed to analyze the required data. Given the limitations of the study, the digital self-engagement of students in the e-learning setting can be said to be affected by TPACK implementation and by teachers' self-awareness about technology integration with online teaching. The findings indicate that integrating technology and appropriate pedagogical tools, and having an awareness of the content knowledge and the outcome variables, will result in students' engagement in digital self-regulated learning by their being digital self-engaged and having increased self-regulation.

RECOMMENDATIONS

Higher education institutions should provide alternatives and solutions to meet both educators' and students' needs by providing students with devices to reduce inequality in remote learning and having colleges and universities offer remote education pedagogy training. Indeed, remote education needs meaningful interaction between the college and students as the complexity of problems that emerged in online learning during the crisis decreased due to technological facilities and teachers training. In addition, teachers should be aware of and trained in technology use in education, and they should adapt their technical skills, pedagogical methods, and teaching style to the online setting.

Further research should involve a strong cooperation with teachers and dialog with them. In addition, training programs should be established to improve the learning capabilities and the level of teachers' engagement with students as they adapt in online learning settings. We also recommend that further studies consider more respondents and varied data collection tools in order to make a more comprehensive image of, and ensure a better representation of, the population in terms of age, gender, and intellectual background.

References

Allen, I. E., & Seaman, J. (2008). Staying the course: Online education in the United States. The Sloan Consortium.

Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. The International Review of Research in Open and Distributed Learning, 12(3), 80–97. https://doi.org/10.19173/irrodl.v12i3.890

Archambault, L. M., & Barnett, J. H. (2010). Revisiting technological pedagogical content knowledge: Exploring the TPACK framework. Computers & Education, 55(4), 1656–1662. https://doi.org/10.1016/j.compedu.2010.07.009

Ariffin, K., Abdul Halim, N., & Azida Darus, N. (2020). Discovering students' strategies in learning English online. Asian Journal of University Education (AJUE), 17(1), 261–268.

Arnold , L. (2006). Understanding and promoting autonomy in UK online higher education. International Journal of Instructional Technology & Distance Learning, 3(7). https://www.itdl.org/Journal/Jul_06/article03.htm

Benta, B., Bologa, G., & Dzitac, I. (2014). E-learning platforms in higher education. Case study. Procedia Computer Science, 31, 1170–1176. https://doi.org/10.1016/j.procs.2014.05.373

Cacheiro-Gonzalez, M. L., Medina-Rivilla, A., Dominguez-Garrido, M. C., & Medina-Dominguez, M. (2019). The learning platform in distance higher education: Student's perceptions. Turkish Online Journal of Distance Education, 20(1), 71–95. https://doi.org/10.17718/tojde.522387

Chanprasitchai, O., & Khlaisang, J. (2016). Inquiry-based learning for a virtual learning community to enhance problem-solving ability of applied Thai traditional medicine students. Turkish Online Journal of Educational Technology, 15(4), 77–87.

Chapelle, C., A. (2001). Computer Applications in Second Language Acquisition: Foundations for Teaching, Testing and Research. Cambridge University Press.

Cohen, E. B., & Nycz, M. (2006). Learning objects and e-learning: An informing science perspective. Interdisciplinary Journal of Knowledge and Learning Objects, 2, 23–34.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry: An International Journal for the Advancement of Psychological Theory, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E. L., & Ryan, R. M. (2011). Self-determination Theory. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), Handbook of theories of social psychology (vol. 1, pp. 416–433). https://doi.org/10.4135/9781446249215

Deci, E. L., Olafsen, A. H., & Ryan, R. M. (2017). Self-determination theory in work organizations: The state of a science. Annual Review of Organizational Psychology and Organizational Behavior, 4, 19–43. https://doi.org/10.1146/annurev-orgpsych-032516-113108

Firat, M. (2016). Measuring the e-learning autonomy of distance education students. International Council for Open and Distance Education, 8(3), 191–201. https://doi.org/10.5944/openpraxis.8.3.310

Harrison E. & McTavish, M. (2018). i' Babies: Infants And Toddlers' Emergent Language and Literacy in a Digital Culture of Idevices. Journal of Early Childhood Literacy 18, 163-188.

Holmberg, B. (1989). Theory and practice of distance education. Routledge.

Janghorban, R., Roudsari, R. L., & Taghipour, A. (2014). Skype interviewing: The new generation of online synchronous interview in qualitative research. International Journal of Qualitative Studies on Health and Well-being, 9(1), 24152. https://doi.org/10.3402/qhw.v9.24152

Jeong, K.O. (2017). The use of moodle to enrich flipped learning for english as a foreign language education. Journal of Theoretical and Applied Information Technology, 95(18), 4845–4852. http://www.jatit.org/volumes/Vol95No18/23Vol95No18.pdf

Keating, T., & Evans, E. (2001). Three computers in the back of the classroom: Pre-serviceteachers' conceptions of technology integration. In J. Price, D. Willis, N. Davis, & J. Willis (Eds.), Proceedings of SITE 2001—Society for Information Technology & Teacher Education International Conference (pp. 1671–1676). AACE. https://www.learntechlib.org/primary/p/17023/

Kör, H., Erbay, H., Demir, E., & Akmese, O. F. (2016). A study on the factors affecting the academic performance of distance education students and formal students. Hitit University Journal of Social Sciences Institute, 9(2), 1029–1050. http://dx.doi.org/10.17218/hititsosbil.280829

Lemke, C., Coughlin, E., & Reifsneider, D. (2009). Technology in schools: What the research says: An update. Commissioned by Cisco.

Lynch, R., & Dembo, M. (2004). The relationship between self-regulation and online learning in a blended learning context. The International Review of Research in Distance Learning, 5(2). https://doi.org/10.19173/irrodl.v5i2.189

Martín-Blas, T., & Serrano-Fernández, A. (2009). The role of new technologies in the learning process: Moodle as a teaching tool in physics. Computers & Education, 52(1), 35–44. https://doi.org/10.1016/j.compedu.2008.06.005

Mat Dawi, A., Theam, L., Palaniandy, M., & Dolah, J. (2016). Penerimaan Alat Web 2.0 dalam Pelaksanaan Kurikulum

Program Berasaskan Pembelajaran Abad Ke-21 di Institut Pendidikan Guru. Jurnal Penyelidikan Dedikasi, 10, 79–97.

Mehrotra, C., Hollister, C. D., & McGahey, L. (2001). Distance learning: Principles for effective design, delivery, and evaluation. Sage Publications.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teachers' knowledge. Teachers College Record, 108(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Moore, M. (1990). Background and overview of contemporary American distance education. In M. G. Moore (Ed.), Contemporary issues in American distance education (pp. xii–xxvi). Pergamon.

Moorhouse, B. L., & Kohnke, L. (2021). Responses of the English-language-teaching community to the COVID-19 pandemic. RELC Journal, 52(3), 359–378. https://doi.org/10.1177/00336882211053052

Ninoriya, S., Chawan, P. M., & Meshram, B. (2011). CMS, LMS, and LCMS for elearning. International Journal of Computer Science Issues (IJCSI), 8(2), 644–647.

Oproiu, G. (2015). A study about using e-learning platform (Moodle) in university teaching process. Procedia Social and Behavioral Sciences, 180, 426–432. https://doi.org/10.1016/j.sbspro.2015.02.140

Ouadoud, M., Nejjari, A., Chkouri, M. Y., & El-Kadiri, K. E. (2018). Learning management system and the underlying learning theories. In M. Ben Ahmed & A. Boudhir (Eds.), Innovations in Smart Cities and Applications. (vol 37, pp 732–744). Springer.

Rahman, H. (2005). Interactive multimedia technologies for distance education in developing countries. In M. Pagani (Ed.), Encyclopedia of multimedia technology and networking (2 vols., pp. 447-453). IGI Global

Reiser, R. A., & Dempsey, J. V. (2012). Trends and issues in instructional design and technology (3rd ed.). Pearson.

Saykılı, A. (2018). Distance education: Definitions, generations, key concepts and future directions. International Journal of Contemporary Educational Research, 5(1), 2–17.

Shelton, K., & Saltsman, G. (2005). An administrator's guide to online education. Information Age Publishing.

Shulman, L. (1986). Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4–14. https://doi.org/10.3102/0013189X015002004

Suresh Babu, G., & Sridevi, K. (2018). Importance of e-learning in higher education: A study. International Journal of Research Culture, 2(5), 84–88.

Wargadinata, W., Maimunah, I., Dewi, E., & Rofiq, Z. (2020). Student's responses on learning in the early COVID-19 pandemic. TADRIS: Journal of Education and Teacher Training, 5(1). https://doi.org/10.24042/tadris.v5i1.6153

Warschauer M. (1996). Computer assisted language learning: An introduction. In S. Fotos (Ed.), Multimedia language teaching (pp. 3–20). Logos International.

Wheelihan, K. J. (2011) Creativity for success. The Creativity Institute. https://creativityinstitute.com/pages/creativity-for-success

Zhao, Y. (Ed.). (2003). What should teachers know about technology? Perspectives and practices. Information Age Publishing.