Journal of Information Technology Education: Research

An Official Publication of the Informing Science Institute
InformingScience.org

JITEResearch.org

Volume 21, 2022

THE IMPACT OF THE RELATIONSHIP OF SOCIAL/EMOTIONAL, COGNITIVE, AND BEHAVIORAL ENGAGEMENTS ON DEVELOPING PRESERVICE TEACHERS' DIGITAL COMPETENCIES

Areej ElSayary*	Zayed University, Abu Dhabi, United Arab Emirates	Areej.elsayary@zu.ac.ae
Laila Mohebi	Zayed University, Dubai, United Arab Emirates	Laila.mohebi@zu.ac.ae
Lawrence Meda	Zayed University, Dubai, United Arab Emirates	Lawrence.meda@zu.ac.ae

* Corresponding author

ABSTRACT

Aim/Purpose	This study investigates the impact of the relationship between social/emotional, cognitive, and behavioral engagements on developing preservice teachers' digital competencies. The social/emotional engagement can be illustrated with actions associated with learning, such as excitement, interest, and motivation. Cognitive engagement is the active process of learning and is the most essential form of learning. Finally, behavioral engagement is the physical behavior associated with doing the work and following the rules.
Background	Teachers' digital competencies are essential in creating an active e-learning environment that ensures students' engagements and reduces learners' sense of isolation. Due to the lockdown of COVID-19 in March 2020, schools and universities shifted toward e-learning, where higher education in the United Arab Emirates (UAE) experienced a digital transformation. Many questions have been raised about life after COVID-19, competencies needed for the new demands of jobs that do not yet exist, social/emotional development of students, and their engagements in online classes.
Methodology	An explanatory sequential mixed-method approach was utilized, using a quantitative data method followed by a qualitative data method. An online survey was used to collect the quantitative data from participants. The convenient research

Accepting Editor: Tharrenos Bratitsis | Received: February 10, 2022 | Revised: April 7, April 27, 2022 | Accepted: May 26, 2022.
Cite as: ElSayary, A., Mohebi, L., & Meda, L. (2022). The impact of the relationship of social/emotional, cognitive, and behavioral engagements on developing preservice teachers' digital competencies. *Journal of Information Technology Education: Research, 21,* 269-295. https://doi.org/10.28945/4982

	population is female preservice teachers who are considered learners enrolled in semesters 3-8 and learning online. Focus group discussions were used to collect the qualitative data from selected participants.
Contribution	The findings of the study contribute toward a deeper understanding of the relationship between social/emotional, cognitive, and behavioral engagements and their positive impact on developing learners' digital competencies. The results can be leveraged during or after the pandemic to design strategies and pedagogies that enhance learners' engagements and develop their digital competencies based on the conceptual framework of the study.
Findings	The study's results reveal a significant positive correlation between social/emotional, cognitive, and behavioral engagements that lead to the development of preservice teachers' digital competency. The relationship between social/emotional and cognitive engagements is stronger than between cognitive and behavioral engagements, while the relationship between social/emotional and behavioral engagements is balanced.
Recommendations for Practitioners	Instructors need to consider students' well-being and avoid the sense of isolation among students through designing strategies and pedagogies using the framework of the study that enhance learners' engagements. More focus is needed on training instructors and educators in using different interactive applications that enhance learners' and educators' digital competency.
Recommendations for Researchers	The findings provide theoretical evidence of the impact of the relationship between social/emotional, cognitive, and behavioral engagements on developing learners' digital competencies. However, this study was conducted in an early childhood education program in higher education where all the participants were females. It is highly recommended that future research repeats the study with male and female participants, as well as implement the study with different age groups from k-12 students.
Impact on Society	This research highlights the importance of considering the social/emotional, cognitive, and behavioral engagements in developing learners' digital competencies. It is interestingly important to reinforce the teaching, cognitive and social presence among all instructors and teachers due to the positive impact on students' online learning.
Future Research	Future research on measuring the impact of transforming students' design thinking mindset after using interactive technology is recommended. In addition, it is highly recommended to consider measuring how the students' learning is influenced by the teaching presence of their instructors. Also, it is recommended that future research considers measuring the instructors' digital competencies and their impact on planning instructional activities.
Keywords	social/emotional engagement, cognitive engagement, behavioral engagement, digital competency

INTRODUCTION

Educational reform in the United Arab Emirates (UAE) became one of the main goals of the country's National Agenda to shift the focus from dependence on oil to a knowledge-based economy (UAE Vision 2021, 2009). It was stated in the UAE's 2030 agenda that having a higher percentage of high-quality teachers is one of the key performance indicators for sustainable development (UAE National Committee on SDGs, 2017). Due to the lockdown of COVID-19 in March 2020, schools and universities shifted toward e-learning, where adjustments to the annual plans were implemented.

Many questions have been raised about life after COVID-19, competencies needed for the new demands of jobs that do not yet exist, social/emotional development of students, and students' engagements in online classes.

As per the World Education Forum (WEF) report (Schwab & Zahidi, 2020), the digital competencies among the population in the UAE was rated as average (71.7%) in 2019-2020. In response to the COVID-19 lockdown, around 89.6% of work provided opportunities to work remotely. In the WEF report, the current skills in focus as identified by companies surveyed in the UAE are active learning and learning strategies, leadership and social influence, analytical thinking and innovation, quality control and safety awareness, complex problem-solving, critical thinking and analysis, management of personnel, creativity, originality, and initiative, technology use, monitoring and control, and service orientation. The Organization for Economic Cooperation and Development (OECD) Learning Compass 2030 report mentioned three main categories of skills that will be involved in the OECD Future of Education and Skills 2030 project: cognitive and meta-cognitive, social and emotional, and practical and physical. Cognitive and metacognitive skills include critical thinking, creative thinking, learning-to-learn, and self-regulation. Social and emotional skills include empathy, self-efficacy, responsibility, and collaboration. Practical and physical skills include using new information and communication technology devices (OECD, 2020).

Students' engagement is set as a problem in e-learning and needs to be facilitated in three main ways: interacting with content, interaction among students themselves, and interaction with the instructor, where it has been evident historically that there is too much dependence on learner-content interaction alone. Also, Borup et al. (2020) highlighted that universities usually have less focus on students' behavioral and affective engagements and a high focus on cognitive engagement. Students' behavioral engagement can be enhanced synchronously and asynchronously. The enhancement of behavioral and affective engagements in synchronous learning is done through being present, using humor, visiting breakout rooms/groups, being involved in students' chats, and using polls/whiteboards. In asynchronous learning, the enhancement of affective and behavioral engagements is done through regular announcements, video recordings, being proactive and reaching out to students, responding to students promptly, providing timely feedback, and being present in discussion forums.

The study aims to investigate the impact of the relationships between preservice teachers' social/emotional, cognitive, and behavioral engagements on the development of their digital competencies' development in online learning at a federal university in the UAE. This has been a female university for Emirati women for the first ten years. In 2008, the university started the enrollment process for males, where 200 young men joined the university. The university has two campuses in Dubai and Abu Dhabi emirates, with segregation of female and male students on each campus. This study included students in the early childhood education program at the university. All enrolled students in this program are female students. They are taking educational courses, where each course is covered in one semester. The sample of the study included preservice teachers as learners who are enrolled in the STEM and practicum courses.

The study has one main question with two sub-questions as follows: To what extent do the cognitive, social/emotional, and behavioral engagements impact preservice teachers' digital competencies?

1. What is the relationship between cognitive, social/emotional, and behavioral engagement on preservice teachers' digital competencies?
2. What are preservice teachers' perceptions of the development of their digital competencies in online learning?

According to the research questions, the following hypotheses were proposed:

H_1: There is a positive linear relationship between the variables ($\varrho \neq 1$).

H_0: There was no linear relationship between the variables ($\varrho = 0$).

The paper is structured as follows, it begins with an introduction, a section which was presented above. This is followed by a presentation of the literature review and conceptual framework guiding the study. Methodology sections follow thereafter and are followed by findings and discussion. The paper ends with a succinct conclusion and recommendations.

LITERATURE

LEARNERS' ENGAGEMENT

The term "student engagement" is widely used in research which is correlated to students' achievements (Hughes et al., 2008; Kuh et al., 2007; Skinner et al., 1990; Trowler, 2010). Students' engagement in this course is referred to as "academic engagement," which is considered to be the energy exerted toward productive involvement with the course activities (Ben-Eliyahu et al., 2018; Halverson & Graham, 2019). Many factors facilitate and affect students' academic engagement: learner characteristics, personal environment, and course environment. The learner characteristics and personal environment are out of the teachers' control; however, teachers might have some control over the course environment (Borup et al., 2020). Despite the influence of learners' personal environment on their learning, more focus on Moore's (1989) types of interactions (student-content, student-teacher, and student-student) took place. After paying attention to student-student interaction and collaboration in online learning, the Community of Inquiry (CoI) framework was introduced (Garrison et al., 2000). The CoI framework has a significant positive impact on students within online learning. However, it has been criticized for being efficient in online learning only and not for the blended learning approach (Archer, 2010). The ACE framework is considered to be an effective framework that explains the role and interaction of relationships and personal communities in online and blended learning (Borup et al., 2020). Accordingly, the Academic Communities of Engagement (ACE) framework was introduced and used for this study.

In the ACE framework, teachers' role is set to be engagement indicators, whereas they act as facilitators who influence learners' engagements (Skinner et al., 2008). Borup et al. (2020) stated that the ACE framework includes three main indicators of students' engagement (affective, behavioral, and cognitive) that lead to the desired outcomes. In addition, the World Bank Group (2016) identified the types of engagements needed (cognitive, social and behavioral, and technical) and the implication to digital transformation on education and training systems.

Social/emotional engagement (Affective) is the emotional energy associated with learning, such as excitement, interest, and motivation. The teacher's role is to support students for affective engagement by sharing their passion for the topic, learning students' names, knowing them personally, sharing personal stories, and encouraging students. In addition, teachers have to find ways to communicate with students and attract their attention to the topics being taught through discussion boards, announcements, and emails (Broup et al., 2020). Students who do not receive adequate communication can feel isolated and disconnected from the course (Symeonides & Childs, 2015). The teachers' social presence in online learning is important to reduce the sense of isolation. However, it is not sufficient alone (Garrison et al., 2000) as the value and care teachers invest in students are important (Repetto et al., 2010). Furthermore, the ability to provide students with flexibility over facilitating meaningful collaboration in online learning can be another reason for students' sense of isolation (Garrison, 2009; Gill et al., 2015). Collaboration is considered to be within the affective domain; however, it is also correlated with the cognitive domain. In collaborating, students work together to co-construct knowledge or create a product that could not be created individually (Borup et al., 2020). Lee and Koszalka (2016) emphasized that by establishing a social/emotional learning environment, the instructor was able to promote different cognitive engagement tasks for learners. Wood et al. (2018) described the important relationship between cognitive and social/emotional engagement in students' online learning.

Cognitive engagement is the mental ability of students that is directed towards productive involvement in learning activities such as attention, focus, questioning, thinking critically, and problem-solving. For cognitive engagement, teachers can provide appropriate scaffolding, use effective media, apps, and teaching resources, ask open-ended engaging questions that enhance students' curiosity, and raise expectations about students' engagement in discussions (Borup et al., 2020). Anderson et al. (2001) mentioned some identified indicators of instruction such as presenting content, asking questions, summarizing information, confirming understanding, providing constructive feedback, diagnosing misconceptions, and providing resources. Students need to be provided with constructive feedback that helps them understand their weaknesses and strengths and improve their work. The feedback is powerful when it is provided to students promptly (Borup et al., 2020; ElSayary, 2020). Previous studies emphasized that enhancing students' cognitive engagement using the same tasks can lead to a high level of social/emotional and behavioral engagement (Shukor et al., 2015) and enables students to reach a higher order of thinking and a high degree of self-regulation (Nazamud-din et al., 2020). Some of the tasks mentioned in this regard are the use of project-based, problem-based, theme-based, experiential, and discovery learning approaches to foster students' cognitive engagement (Lau et al., 2019; Salam et al., 2016). In addition, cognitive engagement also affects behavioral engagement (Borup et al., 2020). For instance, troubleshooting and orienting is to give proper instructions to students as part of the technological support; this is considered to be below the cognitive engagement. However, it also has an impact on behavioral engagement and is considered to be correlated to it (Anderson et al., 2001).

Finally, *behavioral engagement* is the physical behavior associated with completing the course requirements, such as attendance and submitting tasks. Teachers can facilitate students' behavioral engagement by following up on students, monitoring who missed the class, announcements, and reminders about due dates, and reaching out to help students who do not submit their assignments on time (ElSayary, 2021). In addition, there are other support elements that are aligned with this type of engagement and help students to be fully engaged: troubleshooting and orienting, organizing and managing, and monitoring progress (Borup et al., 2020). Supporting students with troubleshooting and orienting helps them to access the portal more comfortably and understand the expectations and procedures. It is interesting to note that putting students in groups, either synchronous or asynchronous, to complete specific tasks can enhance behavioral engagement. Furthermore, some students underestimate the time and effort required to complete their tasks and need some support (McClendon et al., 2017). Time management and prioritizing tasks are critical and are factors that cause success in behavioral engagement (Hendrix & Degner, 2016; Michinov et al., 2011; Repetto et al., 2010), where there are countless distractions such as social media (Cho & Littenberg-Tobias, 2016). Another important aspect was highlighted by Machado et al. (2016) that technological applications support innovative changes in education and promote students' behavioral engagement and meeting of their diverse needs. On the other side, the results of a study by Jamaludin and Osman (2014) emphasized that students' social/emotional engagement has improved when behavioral engagement occurs through participating in class, applying what they have learned, and using technological applications effectively.

In conclusion, there are some challenges facing learners within the three types of engagements (social/emotional, cognitive, and behavioral) in an online course due to the lack of support from the teachers (Borup et al., 2020). A study by Nazamud-din et al. (2020) mentioned that the correlation between cognitive and behavioral engagements is weaker than the correlation between social/emotional and cognitive engagements. Another study stated that students have little or no interactions with online peers and limited access to the online instructor who is not regularly present to monitor and initiate students' interactions (Oviatt et al., 2018). There should be efforts made by teachers (facilitators) to motivate students, provide time management strategies, and support students to keep them on track (ASU Online, 2017). Li et al. (2021) reported that students who receive higher levels of support also have high social/emotional and cognitive engagement. Another challenge that needs at-

tention is the need to develop different interactive strategies in online and blended programs for students to promote their behavioral engagement (Borup et al., 2020). In addition, a study by Fisher et al. (2017) reported that students in blended learning were more highly engaged in learning than students who only participated in the course online only.

Learners' Competency

In the last two decades, the term competency has gained special importance in the field of education (Mirete et al., 2020). Garcia-Sanz and Morillas (2011) defined competency as the ability to select and mobilize knowledge, skills, and attitudes to respond successfully to a given professional situation. Competency is also defined as cognitive, affective, socio-emotional, and physical capacities in an integrated manner that allows students to act effectively (Perronoud, 2004). Sampson (1998) differentiated between the two terms competence and competency, where competence refers to the capability of learners to carry out a specific task. It is skill-based and used to assess the standard of performance that a learner shows. The characteristics of competence include skills such as communication, collaboration, leadership, critical thinking, creativity, and innovation. On the other hand, Sampson (1998) stated that competency focuses on learners' performance that they showcase when completing a specific task. It is behavior-based and used to assess the behavior in which the standard has been achieved. The characteristics of competency include learners' behavioral attributes such as confidence, determination, motivation, or engagement.

Digital competency can be defined as the ability to technically use digital technologies to work, study, communicate, collaborate, and critically evaluate to participate and commit to the digital culture (Ilomaki et al., 2016). Digital competencies underpin the basic skills in Information and Communication Technology (ICT) that include using computers to retrieve, assess, store, produce, present, exchange information, and communicate and collaborate via the Internet (Perez & Delgado, 2012). It is the efficient and effective use of technological resources to create an active learning environment where students are highly engaged in the learning processes (Mirete et al., 2020). In an educational context, digital competency is related to the transfer of information and the creation of innovative ideas (Ordonez-Olmedo et al., 2021). There has been limited empirical information on how digital competency empowers students to cope with challenges in online learning (Cao et al., 2020; Hasan & Bao, 2020). Even though the digitally competent learners may have the potential to perform productively and responsibly in online learning, they may not have adequate motivation for full engagement when perceiving little support and help from others (Chen & Jang, 2010; Vanslambrouck et al., 2018). Therefore, the study seeks to investigate the relationship between the social/emotional, cognitive, and behavioral engagements in developing learners' digital competencies.

The International Society for Technology in Education (ISTE) standards provide the competencies for learning, teaching, and leading in the digital age (ISTE, 2021). The ISTE standards are developed for different groups of participants such as educators, educational leaders, teachers, learners, coaches, and computational thinking. The ISTE standards for learners are used as a reference in this study that includes the empowered learner, digital citizen, knowledge constructor, innovative designer, computational thinker, creative communicator, and global collaborator. In order to achieve the digital competency through the lens of the three types of engagements (social/emotional, cognitive, and behavioral), it was difficult to use the ISTE standards as they are, as the skills within the standards are overlapped with the types of engagements. Based on the above literature, the learners' survey was created according to the three types of engagements, and the skills within ISTE standards were recategorized and renamed. For instance, the social/emotional engagement included digital citizenship and communication and collaboration. The cognitive engagement included critical thinking, problem-solving, decision making, and research and information fluency. Finally, the behavioral engagement included creativity and innovation and technology operations and concepts. It has been demonstrated that the development of digital competencies enables students to solve complex problems. However, it became essential to facilitate learning for learners in order to manage knowledge that can

be transferred into a new situation through being competent, skilled, creative, critical thinkers, and problem solvers (Burgos-Vileda et al., 2021). According to UNESCO, a low level of digital literacy among teachers, students, and families is demonstrated (Cortes et al., 2020). In addition, there is still a gap in Internet access, skills, and the use of digital tools that facilitate learning (Contreras, 2020).

Conceptual Framework

In 1954, Gordon Allport stated that social psychology understands and explains how people's thoughts, feelings, and behaviors are influenced by the actual, imagined, or presence of other individuals (Thompson & Schonthal, 2020). Building on Vygotsky's (1978) zone of proximal development, the ACE framework describes how students' affective, cognitive and behavioral engagements increase when supported by others. Based on the above literature, Figure 1 below shows the conceptual framework of the study where the development of students' digital competencies occurs through the relationship between cognitive, social-emotional, and behavioral engagements. Students develop certain skills within each type of engagement in online and blended learning approaches, leading to the development of digital competencies.

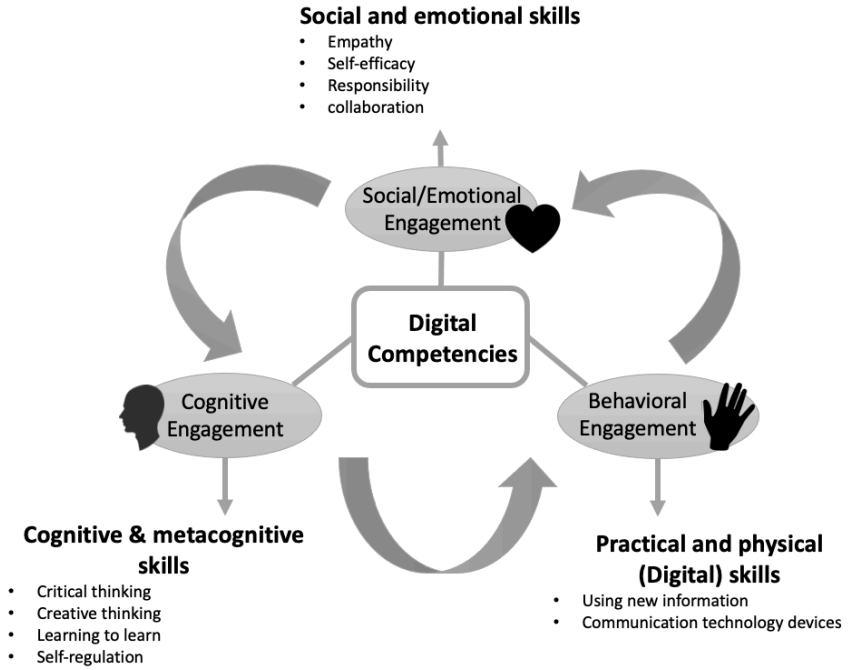

Figure 1: Digital Competencies Framework

METHODOLOGY

The study sought to investigate the impact of the relationship between preservice teachers' cognitive, social/emotional, and behavioral engagements to enhance their digital competencies. The study employs an explanatory sequential mixed-method approach to extend the breadth and depth of the different inquiry methods. It is based on the philosophy of pragmatism that suggests collecting multiple data (qualitative and quantitative) allows for the integration of the results. The study's rationale is to seek the discovery of new perspectives and the recasting of questions or results from one method with results of the other method. Figure 2 shows the sequence of the explanatory mixed-method approach.

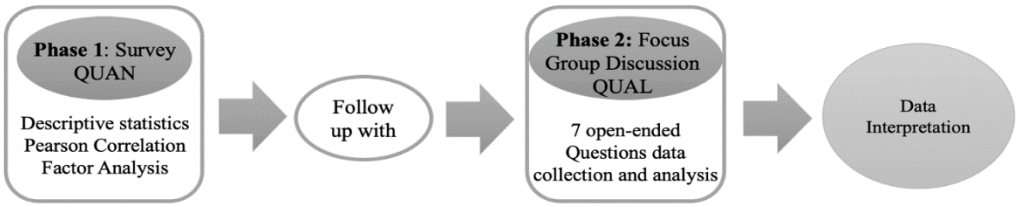

Figure 2: The explanatory sequential mixed-method used in the study

PARTICIPANTS

The participants of the study are preservice teachers in early childhood education study programs in Dubai and Abu Dhabi. The number of students enrolled in semesters 3-8 is 120 students; the targeted sample was 80 preservice teachers, and the final sample selected was n=69. All the participants were females with an age range of 20-25 years old. The criteria set for the sample selection were defined by (i) students who are enrolled in semesters 3-8 and learning online and (ii) those willing to participate in the study. The participants who did not meet the criteria were excluded from the study. According to Cohen's (1998) power table for effect size *d*, an average was estimated of [*d* =] 1.0 with alpha set at .05 and power (1–beta) set at .80, a sample size of at least 29 participants was needed. In order to confirm the study's participant selection, the sample power was measured using the Statistical Package of Social Sciences (SPSS) to be 1.00 using the sample size of 69 participants and $p<0.5$. The power analysis is greater than 0.8, considered high, as per Cohen (1998).

Regarding participants involved in focus group discussions, five mini-focus groups were conducted with selected students (purposeful sample). Each focus group included four students to form 20 students in total. The mini-focus groups were conducted in order for participants to be comfortable and answer the questions in more depth and with more detail (Hennink et al., 2019). According to Coenen et al. (2012), five focus groups are needed in order to reach saturation, where issues begin to be repeated, and no further data is needed. After completing the five mini-focus groups, the researchers reached the saturation point, and there were no further discussions were needed.

INSTRUMENTATION

Digital competency survey

The digital competency survey (see Appendix) was used to collect the quantitative data from preservice teachers to address the first question of the study. The survey included closed-ended items adapted from the ISTE standards framework for students (2017). It is categorized into three categories and six sub-categories, including the following: (i) social/emotional engagement: digital citizenship and communication and collaboration (8 items) (ii) cognitive engagement: critical thinking, problem-solving and decision-making, and research and information literacy (8 items), and (iii) behavioral engagement: creativity and innovation, and technology operations and concepts (8 items). Each sub-category includes four items to form a total of 24 items. The scale used in the survey was: 1=awareness, 2=basic, 3=intermediate, 4=advanced, and 5=expert. For the content validity, the survey was handed to two specialists in educational technology to give their opinions on: (i) the suitability of the tool in relation to the study purpose, (ii) whether the items are appropriate, and (iii) accuracy of the language used. The feedback received was to reword one of the items and add a comment box below each category that allows students to write their comments.

Reliability and validity

The internal consistency of Cronbach's Alpha was measured for the reliability of the instrument. The survey was piloted with 25 preservice teachers, and the reliability test was valued at $\alpha=0.857$ for the

cognitive engagement items, α=0.872 for the emotional/social engagement, and α=0.882 for the behavioral engagement, which was considered suitable for the study. After administering the reliability, the survey was sent to preservice teachers by email using a web survey. In addition, a full explanation of the study's purpose was provided to the preservice teachers, and consent forms were collected.

The Exploratory Factor Analysis (EFA), a statistical analysis method, identifies the underlying relationship between measured variables. For social/emotional engagement, the value of Kaiser-Meyer-Olkin KMO is 0.835, and the Bartlett Chi-square approximation is 449.298 with p=0.000. For cognitive engagement, the value of Kaiser-Meyer-Olkin KMO is 0.899, and the Bartlett Chi-square approximation is 339.487 with p=0.000. For behavioral engagement, the value of Kaiser-Meyer-Olkin KMO is 0.801, and the Bartlett Chi-square approximation is 400.566 with p=0.000. A KMO value close to 1 indicated that the correlation pattern was compact enough to produce different and reliable factors. Thus, the Kaiser-Meyer-Olkin and Bartlett sphericity tests indicated that the EFA method was appropriate for use in this study.

Focus group discussion

The focus group discussion was used to gain additional elaboration on the results of the quantitative data where the second question of the study is addressed. By the end of the course, five focus groups were conducted with selected students using open-ended reflective questions in order to narrow the lens and understand preservice teachers' perceptions. Each focus group included four students to form 20 students in total. Johnson and Christensen (2014) stated that the focus group aims to understand the group's perceptions and impressions of products or programs. The focus group discussions were conducted online using Zoom meetings with an average time of thirty minutes each. The questions used were reflective open-ended questions suggested by Schon's (1983) reflection on learning (8 open-ended questions). After the quantitative data analysis, the focus group discussion questions were reviewed to focus on the aspects that needed elaboration. Then, the questions were sent to two educational experts to determine the face validity and clarity. The experts suggested merging two questions that lead to the same answer (How did you engage in this course? And In your opinion, what was the most creative part of your learning, and why do you think that is?) to be (How did you engage in this course? and what was the most creative part of your learning). They advised deleting the last question as it was considered to be a repetition of question seven. Also, they asked to add one more question: How did you engage in this course? The total number of questions after addressing the experts' recommendations was seven open-ended questions. The questions are listed as the following:

1. What is your background in using technology?
2. What is the most important thing you learned in this course?
3. What do you want to learn more about, and why?
4. Do you think your engagements in online learning improve your performance? Why?
5. How did you engage in this course? And what was the most creative part of your learning?
6. In your opinion, what were the obstacles to online learning?
7. What do you recommend for improving teaching and learning using technology?

Procedure

The consent form was sent to the participants, and a full explanation of the study's purpose was provided. The study was conducted in the English language. However, the survey items were provided in both Arabic and English language to ensure participants' understanding, while the focus group was conducted in the English language. All instruments were anonymous, and participants had the choice not to continue in the study at any point of the research duration. The explanatory sequential mixed-

method design was used in this study. A quantitative approach (digital competency survey) was used to address question 1 (What is the relationship between cognitive, social/emotional, and behavioral engagement on preservice teachers' digital competencies?). The survey results were analyzed using inferential statistics to address the Pearson correlation test and exploratory and confirmatory factor analysis. The SPSS is used to run the tests and complete the analysis.

The quantitative results were used to edit and inform the second instrument (focus group discussion) of this study, where question 2 (What are the preservice teachers' perceptions on the development of their digital competencies in online learning?) is addressed using open-ended reflective questions. The three types of engagements in the digital competencies (social/emotional, cognitive and behavioral) were used as an analytical framework for qualitative data. Based on the quantitative data results, the focus group discussion questions were reviewed to narrow the lens toward the reasons behind the relationship between the three types of engagement. The results of the focus group discussion involved an interpretive paradigm in providing rich textual data clarification of the quantitative results revealed. It enabled participants to freely express themselves by providing reflection to answer the open-ended questions. The participants' responses in the focus group discussion were edited and proofread to avoid any grammatical mistakes. The quantitative and qualitative data results were presented separately and integrated into the discussion section to fulfill the study's main purpose: investigating the impact of the relationship between preservice teachers' cognitive, social/emotional, and behavioral engagements to enhance their digital competencies.

FINDINGS

DESCRIPTIVE STATISTICS

Table 1 shows the descriptive statistics of the social/emotional engagement with its sub-categories (digital citizenship and communication and collaboration). The highest mean is shown in digital citizenship in two items: demonstrating personal responsibility for lifelong learning (M=3.62, SD=1.415) and exhibiting a positive attitude toward using technology that supports collaboration, learning, and productivity (M=3.57, SD=1.419).

Table 1: The mean and standard deviation of the social/emotional engagement

DIGITAL CITIZENSHIP	MEAN	STD. DEV.
1. Advocate and practice safe, legal, and responsible use of information and technology	3.36	1.283
2. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity	3.57	1.419
3. Demonstrate personal responsibility for lifelong learning	3.62	1.415
4. Exhibit leadership for digital citizenship	3.43	1.131
COMMUNICATION AND COLLABORATION	MEAN	STD. DEV.
1. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media	3.36	1.188
2. Communicate information and ideas effectively to multiple audiences using a variety of media and formats	3.38	1.202
3. Develop cultural understanding and global awareness by engaging with learners of other cultures	3.33	1.184
4. Contribute to project teams to produce original works or solve problems	3.2	1.158

Table 2 shows the descriptive statistics of the cognitive engagement with its sub-categories (critical thinking, problem-solving and decision-making, and research and information). Again, the highest mean is shown in one item in each sub-category: use multiple processes and diverse perspectives to explore alternative solutions (M=3.41, SD=1.062), and locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media (M=3.41, SD=1.048).

Table 2: The mean and standard deviation of the cognitive engagement

CRITICAL THINKING, PROBLEM-SOLVING, AND DECISION-MAKING	MEAN	STD. DEV.
1. Identify and define authentic problems and significant questions for investigation	3.13	1.162
2. Plan and manage activities to develop a solution or complete a project	3.3	1.129
3. Collect and analyze data to identify solutions and/or make informed decisions	3.33	1.172
4. Use multiple processes and diverse perspectives to explore alternative solutions	3.41	1.062
RESEARCH AND INFORMATION FLUENCY	MEAN	STD. DEV.
1. Plan strategies to guide inquiry	3.14	1.192
2. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media	3.41	1.048
3. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks	3.32	1.105
4. Analyze/process data and report results	3.38	1.113

Table 3 shows the descriptive statistics of the behavioral engagement with its sub-categories (creativity and innovation, technology operations, and concepts).

Table 3: The mean and standard deviation of the behavioral engagement

CREATIVITY AND INNOVATION	MEAN	STD. DEV.
1. Apply existing knowledge to generate new ideas, products, or processes	3.41	1.167
2. Create original works as a means of personal or group expression	3.33	1.245
3. Use models and simulations to explore complex systems and issues	3.1	1.126
4. Identify trends and forecast possibilities	3.16	1.133
TECHNOLOGY OPERATIONS AND CONCEPTS	MEAN	STD. DEV.
1. Understand and use technology systems	3.77	1.319
2. Select and use applications effectively and productively	3.77	1.178
3. Troubleshoot systems and applications	3.23	1.126
4. Transfer current knowledge to learning new technologies	3.57	1.254

The highest mean in Table 3 is shown in two items in the technology operations and concepts subcategory: understand and use technology systems (M=3.77, SD=1.319), and select and use applications effectively and productively (M=3.77, SD=1.178).

PEARSON PRODUCT-MOMENT CORRELATION

A Pearson's product-moment correlation was run to assess the relationship between social/emotional, cognitive and behavioral engagements. Cohen (1998) stated the range of the small correlation with coefficient value $0.1 < | r | < 0.3$, moderate correlation with coefficient value $0.3 < | r | < 0.5$, and strong correlation with coefficient value $| r | > 0.5$.

The analysis in Table 4 showed a strong positive correlation between social/emotional and cognitive engagements, $r = .861$, $p < .05$, with social/emotional engagement 74% of the variation in cognitive engagement. Also, there was a strong positive correlation between social/emotional and behavioral engagements, $r = .823$, $p < .05$, with social /emotional engagement 67.7% of the variation in behavioral engagement. Finally, there was a strong positive correlation between cognitive and behavioral engagements, $r = .804$, $p < .05$, with cognitive engagement 64.6% of the variation in behavioral engagement.

Table 4: The Pearson correlation coefficient of the three variables (social/emotional, cognitive and behavioral engagements)

CORRELATIONS				
		Social/emotional	Cognitive	Behavioral
Social/emotional	Pearson Correlation	1	.861**	.823**
	Sig. (2-tailed)		.000	.000
	N	69	69	69
Cognitive	Pearson Correlation	.861**	1	.804**
	Sig. (2-tailed)	.000		.000
	N	69	69	69
Behavioral	Pearson Correlation	.823**	.804**	1
	Sig. (2-tailed)	.000	.000	
	N	69	69	69
**. Correlation is significant at the 0.01 level (2-tailed).				

In conclusion, the correlation test shows that there is a significant positive correlation between the three types of engagement (social/emotional, cognitive, and behavioral), where the increase in one type of engagement causes an increase in the other types. However, the results showed that the relationship between social/emotional and cognitive engagements has the highest impact among them, followed by the relationship between social/emotional and behavioral engagements. Finally, the relationship between cognitive and behavioral engagements is found to be the least high correlation.

FOCUS GROUP DISCUSSION ANALYSIS

Due to the inability to meet in person during the lockdown, the researchers met preservice teachers virtually using Zoom conference. The responses were interpreted to provide rich textual data clarification based on the questions presented in the focus group discussions. Participants freely expressed themselves in providing reflection to answer the open-ended questions.

Q1: What is your background in using technology?

Almost all preservice teachers considered themselves good at using technology, as many of them mentioned that they had used technology since they were students in elementary and middle school. Some of the preservice teachers' responses are provided below:

Example participant response 1: "*I use technology mostly for my study in school and university. Also, I use it for my personal life, where I communicate with my family and friends via social media and play some games online."*
Example participant response 2: *"I am very familiar since middle school, but still struggling in using new applications."*
Example participant response 3: *"I believe I am good at using technology as I use different apps that facilitate my work in the university, such as PowerPoint, Prezi, Nearpod, iMovie, Powtoon, Microsoft Office, and Animaker."*

Q2: What is the most important thing you learned during your online learning?
Preservice teachers shared their experiences of different applications they learned during the quarantine through online learning. In addition, some preservice teachers shared that they reviewed their lesson planning before teaching virtual classes and reflected on their lessons after teaching. This enabled them to search for and learn new strategies to know how to teach online. Some other responses are stated below:

Example participant response 1: *"We learned how to* ***communicate*** *easily through online learning using Zoom, Microsoft Teams, and Adobe Connect and Miro.com that help us learn in addition to learning how to* ***create our own apps*** *using Python and Java. We are going to use these applications in teaching during our practicum courses and after graduation."*
Example participant response 2: *"I realized the importance of asking higher-order thinking questions on students'* ***cognition and thinking skills****. Moreover, I learned new* ***online/virtual learning and teaching tools*** *that would benefit me in the future."*
Example participant response 3: *"During my practicums and internship, I learned that the most important thing is* ***understanding the child*** *and knowing their background, level, ability, learning styles, and other facts about them. As a teacher, if we know all the needed information about our students, we will be able to create lessons, chose suitable and meaningful activities and instructions, assess students, provide support and intervention, and others."*
Example participant response 4: *"The most important thing I have learned in this course was* ***time management****. When I focused on managing my time, my teaching in practicum courses improved. I had the confidence to deviate from my lesson plans if I found a massive gap in students' understanding."*

Q3: What do you want to learn more about, and why?
Preservice teachers shared different ideas and thoughts about things they want to learn to teach effectively online. One of the interesting responses shared was that they were keen to learn more about the role of technology in supporting students' learning. Some of the responses are listed below:

Example participant response 1: *"I would like to learn new teaching strategies that support students learning. Also, I want to learn different approaches to* ***engaging students in group activities*** *in online learning using the power of* ***social interaction*** *and* ***collaborative learning*** *in children learning."*
Example participant response 2: *"I want to learn more about the methods that I can use to* ***make proactive and collaborative tasks*** *that are aligned with the lesson topic."*
Example participant response 3: "*I want to gain more knowledge about* ***classroom management skills****. I believe that for all the lessons to go smoothly, we need to set some behavioral rules. I also would like to learn more about the apps and technology to integrate into our lessons and help children learn in an enjoyable environment. This is because I saw during my internship how* ***children were super engaged with the technology*** *that I used, such as Nearpod, quizzes, Kahoot, Word wall, and others."*

Q4: Do you think your engagements in online learning improve your performance? Why?
Preservice teachers responded to this question differently. Some felt that their engagements in online learning had improved their performances, while others felt that they preferred face-to-face learning. Some students agreed that their engagement in online learning improved their performances where the use of new applications enabled them to practice and integrate these apps into their teaching

practices. They stated that they built various ideas of activities, assessments, and interactions that enhanced their young learners' learning. They became more familiar with a range of technology apps used. The responses are listed below:

> **Example participant response 1:** *"I prefer the* ***face-to-face learning*** *and* ***meet with the instructors****, especially for the* ***collaborative work****. At home, there are many distractions especially when my siblings have their classes at the same time."*
> **Example participant response 2:** *"I genuinely believe that online learning is* ***more challenging than face-to-face learning****, and it requires more effort. So, the teacher must be able to handle the new situation, provide appropriate online teaching instructions and activities, and importantly, monitor the progress and development of the student. When we engage in online learning, we will learn new skills, and it will improve our performance."*

Q5: How did you engage in this course? and what was the most creative part of your learning?

Preservice teachers expressed their positive engagements in online learning, while others had negative experiences. Students who had negative responses stated that the reason was that when they went to breakout rooms, some students did not participate, and the instructor did not check on them. Some of other important responses are stated below:

> **Example participant response 1:** *"I enjoyed the breakout rooms and* ***working collaboratively in groups*** *to complete and present our projects* ***using different applications*** *such as PowToon, iCloud apps, Google docs, Canva, etc. We had opportunity to create interactive online journals and interactive stories for early years. We worked as well on creating short movies for early years using augmented reality applications such as 3D Bear and AR Makr."*
> **Example participant response 2:** *"I engaged in online learning by* ***adopting what I learned in my other education courses*** *and applying it in the practicum courses. I also engaged by* ***writing reflections*** *each time I observe classes virtually, which is great since I can reflect on my teaching and learning practices."*

Q6: In your opinion, what were the obstacles to online learning?

Preservice teachers shared some obstacles they faced during online learning. Some of the responses are stated below:

> **Example participant response 1:** *"The* ***internet connection*** *is the most important problem, especially that we are four siblings at home using the same Wi-fi at the same time for studying. Also, the* ***communication*** *with some instructors is quite challenging as we cannot reach them easily."*
> **Example participant response 2:** "***Time management*** *is the biggest challenge I face. We have a lot of assignments, projects, and journals with the same due dates. It is challenging to finish all of them at the same time."*
> **Example participant response 3:** *"The pressure is that we cannot meet to* ***discuss the assignments*** *with our peers, and it is quite confusing to explain to each other over the internet."*
> **Example participant response 4:** *"I think that online learning limits* ***the interaction between students-teacher and students-students.*** *Also, it might impact students' and teachers' well-being, where they spend much time in front of the technology. Additionally, students lose the desire to learn because of the lack of in-person interaction and limited experiences."*
> **Example participant response 5:** *"It is challenging for some instructors to identify the* ***students' needs and assess their understanding*** *accurately, where facial expression is one way that helps the teacher recognize if they struggle with learning or acquiring part of the material."*

Q7: What do you recommend for improving teaching and learning using technology?

Preservice teachers shared some valuable recommendations to improve online teaching and learning. Some of the examples included the active learning environment, differentiating students' learning,

and redesigning assignments that are suitable for online learning. Below are some of the necessary responses shared:

> **Example participant response 1:** *"Instructors need to use* ***active learning*** *rather than passive learning where a variety of breakout rooms, activities, competitions, practical applications, augmented reality apps, virtual field trips, and other online resources are needed."*
> **Example participant response 2:** *"The class time needs to be shorter and to include* ***more practical work****, either* ***synchronous or asynchronous in collaboration*** *with our colleagues. I would also recommend using music applications such as the Garage band app in online learning as a creative way of attracting students and motivate them to learn."*
> **Example participant response 3:** *"The* ***flexibility of the assignments and projects due dates*** *is needed. Also, we want to have the flexibility of asking our own questions to investigate or to have choices of our research based on our interests."*
> **Example participant response 4:** *"The physical activities are important and motivate students to the lessons. Therefore, I recommend having a* ***blended learning approach*** *as I feel both face-to-face and e-learning are important. We want to meet, socialize, and interact with each other, and we feel that we are more creative in e-learning and we learned many things."*

DISCUSSION

LEARNERS' ENGAGEMENT

The discussion of this section seeks to answer the first question of the study: What is the relationship between cognitive, social/emotional, and behavioral engagement on preservice teachers' digital competencies? The results confirmed the H1: There is a positive linear relationship between the variables (social/emotional, cognitive, and behavioral engagements) ($\varrho \neq 1$). This is also confirmed by Borup et al. (2020), who emphasized the positive correlation that occurred between the social/emotional, cognitive, and behavioral engagements and their impact on students' online learning. Furthermore, the World Bank Group (2016) identified the types of engagements needed (cognitive, social and behavioral, and technical) and the implication of the digital transformation on education and training systems.

Social/emotional engagement

The strongest positive significant correlation was found between the social/emotional and cognitive engagements. This is confirmed by a study by Lee and Koszalka (2016), which emphasized that by establishing a social/emotional learning environment, the instructor was able to promote different cognitive engagement tasks. However, the correlation between social/emotional and behavioral engagements is found to be less than with cognitive engagement. In this section, the highest scores of social/emotional engagement items that have impacted the cognitive and behavioral engagements are explained.

Regarding *digital citizenship*, there were high scores in the following items: exhibiting a positive attitude toward using technology that supports collaboration, learning, and productivity; demonstrating personal responsibility for lifelong learning; and advocating and practicing safe, legal, and responsible use of information and technology. These results are aligned with previous studies that stated the importance of the teachers' presence in online learning to reduce the students' sense of isolation (Garrison et al., 2000) to support their learning and productivity, and develop the responsibility of lifelong learning and accountability toward practicing safe and responsible use of technology (Repetto et al., 2010).

For *communication and collaboration*, the items that showed a high score was communicating information and ideas effectively using a variety of media and formats. Similarly, Symeonides and Childs (2015) stated that students who do not receive adequate communication can feel isolated and disconnected

from the course. Another high score item was contributing to project teams to produce original works or solve problems. These results were aligned with those of Borup et al. (2020), who confirmed that students work together in collaboration to co-construct knowledge or create a product that cannot be created individually.

Cognitive engagement

As mentioned in the previous section, there was a significant positive correlation found between the cognitive and social/emotional engagements. Similarly, Wood et al. (2018) described the important relationship between cognitive and social/emotional engagements in students' online learning. Although the results showed that there was also a significant correlation was found between cognitive and behavioral engagement, it is shown to be the least compared to the social/emotional engagement. The highest scores of the cognitive engagement items that have a positive impact on social/emotional and behavioral engagements were discussed below.

For *critical thinking, problem-solving, and decision-making*, there were high scores in identifying and defining authentic problems and significant questions for investigation using multiple processes and diverse perspectives to explore alternative solutions, and planning and managing activities to develop a solution or complete a project. This is also confirmed by Borup et al. (2020), who emphasized the presence of cognitive engagement when teachers can provide appropriate scaffolding, use effective media, apps, and teaching resources, ask open-ended engaging questions that enhance students' curiosity, and raise expectations about students' engagement in discussions.

For *research and information fluency*, the high scores were shown in evaluating and selecting information resources and digital tools based on the appropriateness of specific tasks; and locating, organizing, analyzing, synthesizing, and ethically using information from a variety of sources and media. Similarly, a study by Anderson et al. (2001) mentioned that some indicators of instruction lead to the occurrence of cognitive engagement, such as presenting content, asking questions, summarizing information, confirming understanding, providing constructive feedback, diagnosing misconceptions, and providing a variety of resources and media.

Behavioral engagement

Finally, it was found that there is a significant positive correlation between behavioral engagement and social/emotional engagement. Results of a study by Jamaludin and Osman (2014) emphasized that students' social/emotional engagement has improved when focusing on behavioral engagement through participating in class, applying what they have learned, and using technological applications effectively. As mentioned earlier that there is a significant positive correlation between cognitive and behavioral engagement. It is considered to be the least compared to social/emotional engagement. Similar results were found in a study by Nazamud-din et al. (2020), which mentioned that the correlation between cognitive and behavioral engagements is weaker than the correlation between social/emotional and cognitive engagements. The highest scores of the behavioral engagement items that have a positive impact on social/emotional and cognitive engagements were discussed below.

For *creativity and innovation*, there were high scores shown in creating original works as a means of personal or group expression. It is interesting to note that Borup et al. (2020) highlighted that putting students in groups, either synchronous or asynchronous, to complete specific tasks can enhance their behavioral engagement. Other high scores were shown in using models and simulations to explore complex systems and issues and identifying trends and forecasting possibilities. In a study by ElSayary (2021), there was an emphasis on teachers' role in following up on students, monitoring who missed the class, announcements, reminders about the due dates, and reaching out to help students who do not submit their assignments on time which keep students engaged behaviorally. A weak correlation was found between troubleshooting systems and applications. This was considered to be the reason for the lowest correlation found between behavioral and cognitive engagement. An-

derson et al. (2001) clarified that giving students technological support through orientation and troubleshooting is considered to be cognitive engagement; however, it also has an impact on behavioral engagement as there is a correlation between them.

Regarding the *technology operations and concepts*, there were high scores shown in transferring current knowledge to learning new technologies; and understanding and using technology systems. This is aligned with a previous study by Jamaludin and Osman (2014), which emphasized that students' social/emotional engagement has improved when behavioral engagement occurs through participating in class, applying what they have learned, and using technological applications effectively. However, the following items in behavioral engagement which has shown moderate results: selecting and using applications effectively and productively. Borup et al. (2020) mentioned that developing interactive strategies and technological tools which are to be used effectively is considered to be one of the challenges educators face.

THE PRESERVICE TEACHERS' PERCEPTIONS

The discussion of this section seeks to answer the second question of the study: What are the preservice teachers' perceptions of the development of their digital competencies in online learning? The preservice teachers discussed the positive experiences they had as well as some challenges faced. In order to address the second question of the study, the preservice teachers' perceptions were discussed and categorized based on the framework of the study to include social/emotional, cognitive, and behavioral engagement.

Social/emotional engagement

The highest results shown in the survey were to demonstrate personal responsibility for lifelong learning using technology. Also, in the results from the focus group discussions, preservice teachers mentioned that they had a proper background in using technology before and after joining the university. Broup et al. (2020) mentioned that the students' background is one factor that affects their engagement in online learning. In addition, it was shown in the survey results that they exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity. Previous studies prioritized facilitating meaningful collaboration in online learning rather than providing students flexibility as it will reduce any sense of isolation (Garrison, 2009; Gill et al., 2015). This was also revealed in the preservice teachers' responses from the focus group discussion, where they worked on different collaborative applications facilitated by their instructors, such as Google docs, iCloud Apps, and Canva, to prepare presentations, discuss work, and complete their projects. Borup et al. (2020) emphasized that the instructors and teachers play a significant role in sustaining social/emotional engagement by providing a supportive and safe learning environment for students to be actively engaged.

The minor responses found were in contributing to project teams to produce original works or solve problems. Participants expressed in the focus group that communication was one of the challenges they faced where some preservice teachers do not contribute even when they meet in breakout rooms to complete their projects. Borup et al. (2020) emphasized that teachers have to find ways to communicate with students and attract their attention to the topics being taught through discussion boards, announcements, and emails. It was mentioned in their discussion that they use different applications for communication, such as Zoom, Microsoft Teams, and Adobe Connect as ways of communication and not only emails, discussion boards, or announcements. However, they mentioned that the instructors' presence is important when involved in their breakout rooms to check their work and communicate with them whenever needed. Similarly, Garrison et al. (2000) pointed out the importance of teachers' social presence in online learning to reduce the students' sense of isolation as they show they value and care about them. On the other hand, preservice teachers expressed different ideas they experienced and learned in their practicum courses about engaging students in online

learning. Nazamud-din et al. (2020) emphasized the importance of two-way commitment where instructors and students have significant roles in facilitating collaboration and communication in online learning.

Regarding well-being, it was mentioned that they needed to meet face-to-face to discuss their assignments. This is supported by results from a study by Boulton et al. (2019), which highlighted the importance of the positive relationship between student engagement and their well-being on campus. A challenge mentioned by many of the students is the distractions they had in their homes, where most of them have siblings learning online at the same time, and this affected the internet connection and caused some noise. One student added that they lost interest in learning, and their target was to submit their assignments. They recommended that the blended learning approach could be a solution to meet and communicate with their peers and instructors easily and have more time to finish their work when they are in online learning. Interesting results were shown by Fisher et al. (2017), which reported that students in blended learning were more highly engaged in learning than students who only participated in the course online only.

Cognitive engagement

The highest result in cognitive engagement is found in using multiple processes and diverse perspectives to explore alternative solutions. Similarly, Borup et al. (2020) stated that teachers can provide appropriate scaffolding, use effective media, apps, and teaching resources, ask open-ended engaging questions that enhance students' curiosity, and raise expectations about students' engagement in discussions. This was also discussed in the focus group, where they emphasized that they use alternative teaching strategies that promote active learning in their practicum courses that were conducted online for early years students. Previous studies highlighted the important use of project-based, problem-based, theme-based, experiential, and discovery learning approaches as excellent approaches to fostering students' engagement in learning (Lau et al., 2019; Salam et al., 2016). Another high result was locating, organizing, analyzing, evaluating, synthesizing, and ethically using information from various sources and media. This is clarified in the focus group discussion, where they realized the importance of asking higher-order thinking questions and how they tried to find the solutions using a variety of online resources. Previous studies mentioned that students reach a higher level of cognitive engagement possessed with a high degree of self-regulation in learning while conducting research, locating, organizing, analyzing, evaluating, and synthesizing information from different sources and media (Anderson et al., 2001; Nazamud-din et al., 2020).

The minor response is found in identifying and defining authentic problems and significant questions for investigation. Preservice teachers clarified in the discussion that they needed some flexibility in asking their own questions or having choices of questions to investigate based on their interests. This was also confirmed in the study by Nazamud-din et al. (2020), who emphasized that a higher level of cognitive engagement occurs when students pose open-ended questions and investigate them based on their interests. Another low response was in planning strategies to guide inquiry, and it was also mentioned in their discussion that they started to realize the benefit of feedback and self-reflection while planning strategies to guide their investigation. A study by ElSayary (2021) emphasized the importance of students' feedback and self-reflection in improving their performances in online learning. The feedback is powerful when it is provided to students promptly (Borup et al., 2020).

Behavioral engagement

The highest response in the behavioral engagement is that preservice teachers understand and use technology systems and use applications effectively and productively. During the focus group discussion, they mentioned some of the applications they used efficiently to complete their work, such as iCloud, Google docs, Canva, miro.com, Padlet, Kahoot, Word wall, and Nearpod.

The survey shows that they can transfer current knowledge to learning new technologies. This was mentioned in the group discussion, where they said they were keen to learn how to use new apps and

use technology to facilitate the teaching and learning process in more creative ways. This is considered to be an essential aspect of students' behavioral engagement. Oga-Baldwin (2019) emphasized the importance of developing preservice teachers' technological pedagogical content knowledge that promoted their digital competencies and consecutively enhanced their behavioral engagement in online learning. This is also aligned with the results of a study by Jamaludin and Osman (2014), which emphasized that students' social/emotional engagement has improved when behavioral engagement occurs through participating in class, applying what they have learned, and using technological applications effectively. They also added that the instructors' presence is set as a challenge in some of their courses, where they struggle to meet their instructors and communicate with them. Similar results were shown in a study stating that students have little or no interactions with online peers and limited access to the online instructor who is not regularly present to monitor and initiate students' interactions (Oviatt et al., 2018). Students' communication with their instructors was considered to be social/emotional engagement that impacted negatively on their behavioral engagement. Borup et al. (2020) emphasized that teachers have to find ways to communicate with students and attract their attention to the topics being taught through discussion boards, announcements, and emails. They highlighted the importance of having clear instructions at the beginning of the semester from all instructors, following up on students, and monitoring their progress to ensure that everyone is on the right path in their learning. A study by Mirete et al. (2020) concluded the reinforcement of the relationship between teaching strategies, positive intentions, and the use and application of technology in developing teachers' digital competency. In addition, time management was set as the biggest challenge they faced where most of the assignments' due dates were very close to each other, and they felt overwhelmed in meeting the deadlines. The same challenge was highlighted by McClendon et al. (2017), who stated that students underestimate the time and effort required to complete their tasks which affects their behavioral engagement. Similarly, previous studies stated that time management and prioritizing tasks were critical and were factors that led to success in behavioral engagement (Hendrix & Degner, 2016; Michinov et al., 2011; Repetto et al., 2010), where there are countless distractions such as social media (Cho & Littenberg-Tobias, 2016).

In the creativity and innovation sub-category, preservice teachers confirmed that they could apply existing knowledge in their teaching strategies to generate new ideas, products, or processes and can create original works as a means of personal or group expression. This result proved what Ordonez-Olmedo et al. (2021) mentioned the transfer of information and creation of innovative ideas in an educational context lead to the development of digital competency. They created their own applications using Python and Java that could be used in their teaching during the practicum courses and after graduation. Similarly, Borup et al. (2020) highlighted that putting students in groups, either synchronous or asynchronous, to complete specific tasks can enhance their behavioral engagement. In addition, they confirmed creating interactive stories and journals using iCloud apps, PowToon, and Canva. They also created short, animated movies using 3D Bear and AR Makr applications to teach early years in their practicum courses. However, a few students were struggling to understand and use new applications initially, but they mentioned that, in time, they got used to them. Machado et al. (2016) emphasized that technological applications support innovative changes in education, and these promote students' behavioral engagement and meet their diverse needs. The minor response was found to be in using models and simulations to explore complex systems and issues, where it is considered to be a correlation between behavioral and cognitive engagement. Similar results were found in a study by Nazamud-din et al. (2020), which mentioned that the correlation between cognitive and behavioral engagements is weaker than the correlation between social/emotional and cognitive engagements. Preservice teachers confirmed through their discussion that they need to learn more about integrating new applications into their teaching strategies by using the Garage band and iMovie applications. It is interesting to note that Borup et al. (2020) stated that one of the challenges is to develop different interactive strategies in online and blended programs for students to promote their

behavioral engagement. Likewise, learning using technology can happen independently, can be synchronous or asynchronous, and is a continuum that extends throughout students' lives (Cobo & Moravec, 2011).

CONCLUSION AND RECOMMENDATION

Students' engagement is set as a problem in online learning that needs to be facilitated in three main ways: social/emotional, cognitive, and behavioral engagement. It has been evident historically that there is too much dependence on cognitive engagement and less focus on behavioral and affective engagements in online learning (Borup et al., 2020). In addition, there has been limited empirical information on how digital competency empowers students to cope with challenges in online learning (Cao et al., 2020; Hasan & Bao, 2020). This study is conducted using an explanatory mixed-method approach applied to female preservice teachers (learners) in an early childhood program in a federal university in UAE. The digital competency survey was used to investigate the impact of the relationship between types of engagement and the study also used focus group discussions to understand learners' perceptions. By investigating the impact of the relationship between social/emotional, cognitive and behavioral engagements, this study established that preservice teachers' digital competencies were developed with a strong correlation between the three types of engagements that enhance online and blended learning. It was noticeable in the results that social/emotional engagement has a positive, strong correlation with cognitive and behavioral engagement. In other words, learners exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity which consequently develops their digital competency. However, the relationship between social/emotional and cognitive engagements was stronger than the relationship between cognitive and behavioral engagements. Troubleshooting and orientation were considered to be the reason for the least strong correlation which occurred between cognitive and behavioral engagements. This was clarified in the focus group, where students stated they faced a lot of technical and environmental issues related to the internet and technology access (behavioral engagement), where they did not receive a proper orientation (cognitive engagement).

Although the preservice teachers shared some positive experiences, it was also important to pay attention to the challenges faced that might negatively affect the relationship between the types of engagements and the development of digital competency. One of the challenges was the importance of the teachers' presence to reduce the students' sense of isolation. Furthermore, there is a need to expose preservice teachers to different interactive applications that enhance learning and highly develop their digital competency. Although preservice teachers highlighted the need for having a blended learning approach that enhanced their well-being by interacting together on campus, it was also important to give them proper orientation on how to use new interactive applications that enhance communication and reduce the sense of isolation.

One of the main limitations of this study was that the sub-categories presented in each type of engagement were intertwined in a very complex way, which caused the researchers to rely heavily on multiple ways of collecting and analyzing data to validate the results. In addition, the sequential mixed-method required that one method follow the other, and this was challenging for the researchers to try to determine the point of interference at which the results from the first phase would become the focus of investigation in the second phase. Another limitation of the study was the sample selected, where all learners were female students who were enrolled in the early childhood education program. There were no male students enrolled in this program. Finally, the lockdown during the COVID-19 pandemic forced the researchers to communicate virtually with the participants for focus group discussions. Future research on measuring the impact of transforming students' design thinking mindset after using interactive technology is recommended. In addition, it is highly recommended to consider measuring how students' learning is influenced by the teaching presence of their instructors. Also, it is recommended that future research consider measuring the instructors' digital competencies and their impact on planning instructional activities.

REFERENCES

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks*, *5*(2), 1– 17. https://doi.org/10.24059/olj.v5i2.1875

Archer, W. (2010). Beyond online discussions: Extending the community of inquiry framework to entire courses. *The Internet and Higher Education*, *13*(1–2), 69. https://doi.org/10.1016/j.iheduc.2009.10.005

ASU Online. (2017, February 23). *ASU Online launches success center*. Arizona State University. https://asuonline.asu.edu/newsroom/online-learning-tips/asu-online-launches-success-center/

Ben-Eliyahu, A., Moore, D., Dorph, R., & Schunn, C. D. (2018). Investigating the multidimensionality of engagement: Affective, behavioral, and cognitive engagement across science activities and contexts. *Contemporary Educational Psychology*, *53*, 87–105. https://doi.org/10.1016/j.cedpsych.2018.01.002

Borup, J., Graham, C. R., West, R. E., Archambault, L., & Spring, K. J. (2020). Academic communities of engagement: An expansive lens for examining support structures in blended and online learning. *Educational Technology Research & Development*, *68*(2), 807-832. https://doi.org/10.1007/s11423-020-09744-x

Boulton, C. A., Hughes, E., Kent, C., Smith, J. R., & Williams, H. T. P. (2019). Student engagement and well-being over time at a higher education institution. *PLoS ONE*, *14*(11), e0225770. https://doi.org/10.1371/journal.pone.0225770

Burgos-Vileda, C.G. Rojas, W.A.C. Meneses, E.L. & Martinez, J. (2021). Sigital competence analysis of university students using latent classes. *Science Education*, *11*(385), 1-16. https://doi.org/10.3390/educsci11080385

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, *287*, 112934. https://doi.org/10.1016/j.psychres.2020.112934

Chen, K. C., & Jang, S. J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior*, *26*(4), 741–752. https://doi.org/10.1016/j.chb.2010.01.011

Cho, V., & Littenberg-Tobias, J. (2016). Digital devices and teaching the whole student: Developing and validating an instrument to measure educators' attitudes and beliefs. *Educational Technology Research and Development*, *64*(4), 643–659. https://doi.org/10.1007/s11423-016-9441-x

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge. https://doi.org/10.4324/9780203771587

Cobo, C., & Moravec, J. (2011). Introducción al aprendizaje invisible: La (r) evolución fuera del aula [Introduction to invisible learning: The (r)evolution outside the classroom]. In C. Cobo & J. Moravec, *Aprendizaje invisible: Hacia una nueva ecología de la educación* (pp. 17–46). Colección Transmedia XXI. Barcelona: Universidad de Barcelona. http://www.razonypalabra.org.mx/varia/AprendizajeInvisible.pdf

Coenen, M., Coenen, T., Stamm, T. A., Stucki, G., & Cieza, A. (2012). Individual interviews and focus groups in patients with rheumatoid arthritis: A comparison of two qualitative methods. *Quality of Life Research*, *21*(2), 359–370. https://doi.org/10.1007/s11136-011-9943-2

Contreras, M. D. G. (2020). Educar en tiempos de pandemia: Acentuación de las desigualdades en el sistema educativo Chileno [Educating in times of pandemic: Accentuation of inequalities in the Chilean educational system]. *Caminhos da Educação: Diálogos, Culturas e Diversidades*, *2*(2), 43–69. https://doi.org/10.26694/caedu.v2i2.11241

Cortés, F., De Tezanos-Pinto, P., Helsper, E., Lay, S., Manzi, J., & Novoa, C. (2020). Se ha reducido la brecha digital en Chile? Diferencias entre acceso, uso y factores asociados al empleo de Internet [Has the digital divide in Chile been reduced? Differences between access, use and factors associated with the use of the Internet]. *Midevidencias*, *22*, 1–6. https://mideuc.cl/wp-content/uploads/2020/08/MIDevidencias-N22.pdf

ElSayary, A. (2020). The impact of using reflective, communicating and instrumental learning on developing students' STE(A)M competencies. In *ICTEL2020- International Conference on Teaching, Education and Learning, PEOPLE: International Journal of Social Sciences* (p. 23). Dubai; PEOPLE: International Journal of Social Sciences ISSN 2454-5899. https://teraweb.org/wp-content/uploads/2020/02/TERA-International-Conference-Dubai-February-2020.pdf

ElSayary, A. (2021). Using reflective practice model to teach STEM education in a blended learning environment. *Eurasia Journal of Mathematics, Science, and Technology Education,* 17(2), em1942. https://doi.org/10.29333/ejmste/9699

Fisher, R., Ross, B., & Laferriere, R. (2017) Flipped learning, flipped satisfaction, getting the balance right. *Teaching & Learning Inquiry*, *5*(2), 114–127. https://doi.org/10.20343/teachlearninqu.5.2.9

García-Sanz, M. P., & Morillas, L. R. (2011). La planificación de evaluación de competencias en educación superior [Competency assessment planning in higher education]. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, *14*(1), 113–124. https://dialnet.unirioja.es/descarga/articulo/3678782.pdf

Garrison, R. (2009). Implications of online learning for the conceptual development and practice of distance education. *International Journal of E-Learning & Distance Education / Revue Internationale du E-learning et la Formation à Distance*, *23*(2), 93–104. http://www.ijede.ca/index.php/jde/article/download/471/888

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, *2*(2–3), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Gill, B., Walsh, L., Wulsin, C. S., Matulewicz, H., Severn, V., Grau, E., & Kerwin, T. (2015). *Inside online charter schools*. Cambridge, MA: Walton Family Foundation and Mathematica Policy Research. http://www.mathematica-mpr.com/~/media/publications/pdfs/education/inside_online_charter_schools.pdf

Halverson, L. R., & Graham, C. R. (2019). Learner engagement in blended learning environments: A conceptual framework. *Online Learning*, *23*(2), 145-178. https://doi.org/10.24059/olj.v23i2.1481

Hasan, N., & Bao, Y. (2020). Impact of "e-Learning crack-up" perception on psychological distress among college students during COVID-19 pandemic: A mediating role of "fear of academic year loss". *Children and Youth Services Review*, *118*, 105355. https://doi.org/10.1016/j.childyouth.2020.105355

Hendrix, N., & Degner, K. (2016). Supporting online AP students: The rural facilitator and considerations for training. *American Journal of Distance Education*, *30*(3), 133–144. https://doi.org/10.1080/08923647.2016.1198194

Hennink, M. M., Kaiser, B. N., & Weber, M. B. (2019). What influences saturation? Estimating sample sizes in focus group research. *Qualitative Health Research*, *29*(10), 1483–1496. https://doi.org/10.1177/1049732318821692

Hughes, J. N., Luo, W., Kwok, O. M., & Loyd, L. K. (2008). Teacher-student support, effortful engagement, and achievement: A 3-year longitudinal study. *Journal of Educational Psychology*, *100*(1), 1–14. https://doi.org/10.1037/0022-0663.100.1.1

Ilomaki, L., Paavola, S., Lakkala, M., & Kantosalo, A. (2016). Digital competence – An emergent boundary concept for policy and educational research. *Education and Information Technologies*, *21*(3), 655-679. https://doi.org/10.1007/s10639-014-9346-4

International Society for Technology in Education. (2022). *ISTE standards: Student*. https://www.iste.org/standards/iste-standards-for-students

Jamaludin, R., & Osman, S. Z. M. (2014). The use of a flipped classroom to enhance engagement and promote active learning. *Journal of Education and Practice*, *5*(2), 124-131. https://iiste.org/Journals/index.php/JEP/article/view/10648/10875

Johnson, B., & Christensen, L. (2014). *Educational research: Quantitative, qualitative, and mixed-method*. SAGE.

Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2007). Piecing together the student success puzzle: Research, propositions, and recommendations. *ASHE Higher Education Report*, *32*(5), 1–182. https://doi.org/10.1002/aehe.3205

Lau, P. Y. Y., Lee, C. K. C., & Ho, C. (2019). University student engagement in learning: Insights from academic fieldtrips in the Malaysian tropical rainforests. *Education + Training*, *61*(3), 342-358. https://doi.org/10.1108/ET-02-2018-0045

Lee, S., & Koszalka, T. A. (2016). Course-level implementation of first principles, goal orientations and cognitive engagement: A multilevel mediation model. *Asia Pacific Education Review*, *17*(2), 365-375. https://doi.org/10.1007/s12564-016-9431-z

Li L, Flynn KS, DeRosier ME, Weiser G and Austin-King K. (2021). social- emotional learning amidst COVID-19 school closures: Positive findings from an efficacy study of adventures aboard the S.S. GRIN Program. *Frontiers in Education*, 6. https://doi.org/10.3389/feduc.2021.683142

Machado, M. S. P., Sepulveda, G. C. T., & Montoya, M. S. R. (2016). Educational innovation and digital competencies: The case of OER in a private Venezuelan university. *International Journal of Educational Technology in Higher Education*, *13*(1), Artcile 10. https://doi.org/10.1186/s41239-016-0006-1

McClendon, C., Massey Neugebauer, R., & King, A. (2017). Grit, growth mindset, and deliberate practice in online learning. *Journal of Instructional Research*, *8*, 8–17. https://doi.org/10.9743/JIR.2017.2

Michinov, N., Brunot, S., Le Bohec, O., Juhel, J., & Delaval, M. (2011). Procrastination, participation, and performance in online learning environments. *Computers & Education*, *56*(1), 243–252. https://doi.org/10.1016/j.compedu.2010.07.025

Mirete, A. B., Maquilon, J. J., Mirete, L., & Rodriguez, R. A. (2020). Digital competence and university teachers' conceptions about teaching: A structural causal model. *Sustainability*, *12*(12), 4842. https://doi.org/10.3390/su12124842

Moore, M. G. (1989). Three types of interaction [Editorial]. *American Journal of Distance Education*, *3*(2), 1–7. https://doi.org/10.1080/08923648909526659

Nazamud-din, A., Zaini, M. H., & Jamil, N. H. M. (2020). The relationship of affective, behavioral and cognitive engagements in ESL higher learning classroom. *English Language Teaching and Linguistics Studies*, *2*(4), 48-64. https://doi.org/10.22158/eltls.v2n4p48

OECD. (2020, September 24). Strengthening online learning when schools are closed: The role of families and teachers in supporting students during the Covid-19 crisis. *OECD Policy Responses to Coronavirus (COVID-19)*. http://www.oecd.org/coronavirus/policy-responses/strengthening-online-learning-when-schools-are-closed-the-role-of-families-and-teachers-in-supporting-students-during-the-covid-19-crisis-c4ecba6c/

Oga-Baldwin, W. L. Q. (2019). Acting, thinking, feeling, making, collaborating: The engagement process in foreign language learning. *System*, *86*, 102128. https://doi.org/10.1016/j.system.2019.102128

Ordóñez-Olmedo, E., Vázquez-Cano, E., Arias-Sánchez, S., & López-Meneses, E. (2021). Las competencias en el uso de las tecnologías de la información y la comunicación en el alumnado universitario [Competencies in the use of information and communication technologies in university students]. *Pixel Bit Revista de Medios y Educación*, *2021*(60) 153–167. https://doi.org/10.12795/pixelbit.74860

Oviatt, D. R., Graham, C. R., Borup, J., & Davies, R. S. (2018). Online student use of a proximate community of engagement in an independent study program. *Online Learning*, *22*(1), 223-251. https://doi.org/10.24059/olj.v22i1.1153

Pérez, M. A., & Delgado, A. (2012). De la competencia digital y audiovisual a la competencia mediática: Dimensiones e indicadores [From digital and audiovisual competence to media competence: Dimensions and indicators]. *Comunicar*, *XX*(39), 25–34. https://doi.org/10.3916/C39-2012-02-02

Perronoud, P. (2004). *Diez nuevas competencias a enseñar* (1st ed.). Graó. https://www.uv.mx/dgdaie/files/2013/09/Philippe-Perrenoud-Diez-nuevas-competencias-para-ensenar.pdf

Repetto, J., Cavanaugh, C., Wayer, N., & Liu, F. (2010). Virtual schools: Improving outcomes for students with disabilities. *Quarterly Review of Distance Education*, *11*(2), 91–104. https://www.learntechlib.org/p/53204/

Salam, F., Mailok, R., Ubaidullah, N., & Ahmad, U. (2016). The effect of project-based learning against students' engagement. *International Journal of Development Research*, *6*(2), 6891-6895. https://www.journalijdr.com/sites/default/files/issue-pdf/4861.pdf

Sampson, J. P. (1998). The internet as a potential force for social change. In C. C. Lee, & G. R. Walz (Eds.), *Social action: A mandate for counselors* (pp. 213–225). University of North Carolina, ERIC Clearinghouse on Counseling and Student Services.

Schon, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.

Schwab, K., & Zahidi, S. (2020, October). The future of jobs report 2020. *World Economic Forum*. http://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf

Shukor, N. A., Tasir, Z., Meijden, H. V., & Harun, J. (2015). A predictive model to evaluate students' cognitive engagement in online learning. *Procedia – Social and Behavioral Sciences*, *116*, 4844-4853. https://doi.org/10.1016/j.sbspro.2014.01.1036

Skinner, E. A., Wellborn, J. G., & Connell, J. P. (1990). What it takes to do well in school and whether I've got it: A process model of perceived control and children's engagement and achievement in school. *Journal of Educational Psychology*, *82*(1), 22–32. https://doi.org/10.1037//0022-0663.82.1.22

Skinner, E., Furrer, C., Marchand, G., & Kindermann, T. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? *Journal of Educational Psychology, 100*(4), 765–781. https://doi.org/10.1037/a0012840

Symeonides, R., & Childs, C. (2015). The personal experience of online learning: An interpretative phenomenological analysis. *Computers in Human Behavior*, *51*(Part A), 539–545. https://doi.org/10.1016/j.chb.2015.05.015

Thompson, L., & Schonthal, D. (2020). The social psychology of design thinking. *California Management Review, 62*(2), 84–99. https://doi.org/10.1177/0008125619897636

Trowler, V. (2010). *Student Engagement Literature Review*. The Higher Education Academy. https://pure.hud.ac.uk/en/publications/student-engagement-literature-review

UAE Vision 2021. (2009). *Vision 2021: United in ambition and determination*. http://www.vision2021.ae

UAE National Committee on SDGs. (2017). *UAE and the 2030 Agenda for sustainable development: Excellence in implementation*. https://sustainabledevelopment.un.org/content/documents/20161UAE_SDGs_Report_Full_English.pdf

Vanslambrouck, S., Zhu, C., Lombaerts, K., Philipsen, B., & Tondeur, J. (2018). Students' motivation and subjective task value of participating in online and blended learning environments. *The Internet and Higher Education*, *36*, 33–40. https://doi.org/10.1016/j.iheduc.2017.09.002

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press. https://doi.org/10.2307/j.ctvjf9vz4

Wood, B. E., Taylor, R., Atkins, R., & Johnston, M. (2018). Pedagogies for active citizenship: Learning through affective and cognitive domains for deeper democratic engagement. *Teaching and Teacher Education*, 75, 259-267. https://doi.org/10.1016/j.tate.2018.07.007

World Bank Group (2016, January 13). *World development report 2016: Digital dividends overview*. http://documents.worldbank.org/curated/en/961621467994698644/World-development-report-2016-digital-dividends-overview

APPENDIX

DIGITAL COMPETENCIES SURVEY

The purpose of this survey is to examine your digital competencies in three different areas: social/emotional, cognitive and behavioral engagements. The social/emotional engagement includes digital citizenship and communication and collaboration. The cognitive engagement includes critical thinking, problem-solving, and decision-making, and research and information literacy. Finally, the behavioral engagement includes creativity and innovation, and technology operations and concepts. The survey will take 15-30 minutes and the information collected from this survey will be kept confidential. Please use the key below to rate your level using the scale below.

(1) Awareness
(2) Basic
(3) Intermediate
(4) Advanced
(5) Expert

Rate your level of SOCIAL/EMOTIONAL ENGAGEMENT in the following items:					
DIGITAL CITIZENSHIP	1	2	3	4	5
1. Advocate and practice safe, legal, and responsible use of information and technology					
2. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity					
3. Demonstrate personal responsibility for lifelong learning					
4. Exhibit leadership for digital citizenship					
COMMUNICATION AND COLLABORATION	1	2	3	4	5
1. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media					
2. Communicate information and ideas effectively to multiple audiences using a variety of media and formats					
3. Develop cultural understanding and global awareness by engaging with learners of other cultures					
4. Contribute to project teams to produce original works or solve problems					

Rate your level of COGNITIVE ENGAGEMENT in the following items:					
CRITICAL THINKING, PROBLEM SOLVING, AND DECISION-MAKING	1	2	3	4	5
1. Identify and define authentic problems and significant questions for investigation					
2. Plan and manage activities to develop a solution or complete a project					
3. Collect and analyze data to identify solutions and/or make informed decisions					
4. Use multiple processes and diverse perspectives to explore alternative solutions					
RESEARCH AND INFORMATION FLUENCY	1	2	3	4	5
1. Plan strategies to guide inquiry					
2. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media					
3.Evaluate and select information sources and digital tools based on the appropriateness to specific tasks					
4. Analyze/process data and report results					
Rate your level of BEHAVIORAL ENGAGEMENT in the following items:					
CREATIVITY AND INNOVATION	1	2	3	4	5
1. Apply existing knowledge to generate new ideas, products, or processes					
2. Create original works as a means of personal or group expression					
3. Use models and simulations to explore complex systems and issues					
4. Identify trends and forecast possibilities					
TECHNOLOGY OPERATIONS AND CONCEPTS	1	2	3	4	5
1. Understand and use technology systems					
2. Select and use applications effectively and productively					
3. Troubleshoot systems and applications					
4. Transfer current knowledge to learning of new technologies					

AUTHORS

Areej ElSayary holds a Ph.D. in Educational Leadership and Management. She is currently working as an Assistant Professor in the College of Interdisciplinary. Previously, she was the Graduate Program Coordinator in the Department of Education Studies at Zayed University, UAE. Her areas of research interest are Cognitive Development, Interdisciplinary STE(A)M Curriculum, Interactive, Immersive, and Applied Technology, and Teacher Education. She is a certified online instructor and certified Apple Teacher.

Dr. Laila Mohebi holds a Ph.D. in Educational Leadership and Management. She is currently working as an Assistant Professor in the Department of Education Studies at Zayed University, UAE. Laila Mohebi's research interest is mostly related to teacher education, teacher candidate feedback after teaching, early childhood education, field experience and technology, pedagogy, and content knowledge (TPACK).

Lawrence Meda holds a Ph.D. in Curriculum Studies. He is currently working as an Assistant Professor and Chair of the Department of Education Studies at Zayed University in the UAE. His areas of research interest are Inclusive Education, Curriculum Studies, and Educational Technology. He is a certified online instructor.