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# Exploring Pre-Service English Teachers' Digital Competence in Creating Interactive Instructional Materials

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## Abstract

*The Digital Competence of Educators (DigCompEdu) is critical in 21st-century education, which helps educators teach digital literacy to students. However, published empirical evidence regarding pre-service English teachers' competence in creating interactive instructional materials with specific software applications remains scarce. This paper is grounded on the implementation of digital instructional courses at an Indonesian state university, aiming at developing pre-service EFL teachers' digital competencies in designing interactive instructional materials using PowerPoint, Audacity, CapCut, Inknoe ClassPoint, Filmora, the Internet, and Canva (hereafter PACIFIC). The paper describes the pre-service English teachers' self-reported abilities and challenges in designing the PACIFIC-based interactive teaching materials after completing these courses. Guided by the DigCompEdu framework, the primary data from six focus group interviews with a total number of 30 participants were analyzed by using thematic analysis. The study indicates that pre-service EFL teachers reported an adequate level of competencies in designing digital interactive instructional materials in four aspects of the DigCompEdu framework. They also reported several challenges while creating the teaching materials, mostly related to resources, such as internet connectivity and subscription access to the PACIFIC software. These findings highlight the critical need for better resource allocation and*

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*support to improve pre-service EFL teachers' digital literacy and performance in designing digital teaching materials.*

**Keywords:** Digital Competence of Educators, digital literacy, PACIFIC application, pre-service English teachers.

## 1. INTRODUCTION

The use of digital tools in classrooms is increasingly prevalent in the recent digital world. Today's educators, pre-service teachers, and students utilize more digital devices than ever before, including smartphones, laptops, computers, and the Internet to support learning (Kukulska-Hulme et al., 2017). Consequently, they rely more heavily on digital resources such as texts, images, photos, animations, videos, graphics, and audio, which have been proven beneficial for teaching and learning (Richter et al., 2016). However, a gap between technical capabilities and the practical use of digital technologies in teaching and learning is a common worldwide issue (McGarr & McDonagh, 2021). This is because the education system is lagging in equipping pre-service teachers with the deep knowledge and skills to effectively create visual content (Costa & Xavier, 2016). Therefore, developing the digital competencies of pre-service and in-service teachers is essential, particularly in preparing students for life and careers that require 21st-century skills (Starkey, 2020).

Research has shown that many pre-service teachers cannot design, create, and implement interactive digital teaching materials and presentations when they graduate and enter the workforce (Redecker, 2017). They often lack the willingness and ability to demonstrate the necessary digital skills for teaching and learning with technology (Elstad & Christophersen, 2017). This problem is also prevalent among Indonesian English as a Foreign Language (EFL) teacher candidates. Furthermore, there is no consensus on effective approaches to teaching digital literacy, especially on which strategies should be integrated and for whom (Gudmundsdottir & Hatlevik, 2018). This highlights the need for contextualized digital literacy instruction that suits the learners' needs and literacy levels.

To help bridge these gaps, teacher education institutions and educators have a responsibility to demonstrate and integrate technology into the teaching and learning process to adequately train pre-service teachers in the use of technology. In particular, technology courses offered at universities should be modified to utilize the myriad of available application software (Tondeur et al., 2017). Teacher educators must enhance their digital competencies within their curricula to improve their pre-service teachers' digital and pedagogical competencies (Ferrari et al., 2012).

Moreover, pre-service teachers need opportunities to design their own digital interactive instructional materials, which can be provided during their teaching candidature through offering multiple digital literacy courses. In Indonesia, the English-Study-Program at Universitas Mulawarman (2020, 2021) has created a beneficial program that integrated several digital applications, including the PACIFIC tool, to help learners develop their digital literacy skills. Grounded on two digital literacy courses offered at Universitas Mulawarman in Indonesia, this paper aims to describe pre-service EFL teachers' digital competencies in designing interactive instructional materials using the PACIFIC tools. Students enrolled in the Technology

in Education (TiE) course were in the fourth semester (year 2) of an 8-semester program. This course covered the knowledge and skills necessary to install and operate mobile and desktop applications, such as Google Form, Google Site, Flipgrid, Quizizz, Slido, Liveworksheet, Genially, and Mentimeter. Additionally, the TiE course also included Infographics (Fadzil, 2018), Cognitive Theory of Multimedia Learning (Mayer, 2014), and Media Literacy (Hoechsmann & Poyntz, 2012). In the fifth semester, those students took a Digital Literacy (DL) course, a continuation of the TiE course, focussing on developing the pre-service teachers' practical digital skills using PowerPoint, Audacity, CapCut, Inknoe ClassPoint, Filmora, Internet Canva, EdPuzzle, Easelly, and Blush. While TiE focused on designing digital technology materials, the DL course offered students the opportunity to apply their digital technology knowledge in practice. All pre-service teachers were further taught various digital technology issues during the DL course. They were taught about copyright issues and academic conventions, i.e., citation and modification systems for the images they used in their projects and presentations (Khachatryan, 2021). As part of the course assessment, they had to create digital instructional materials using various software they had learned. However, little evidence has been published regarding pre-service teachers' competence in conducting this task.

Therefore, this current study is important to find out about their abilities and challenges in creating interactive instructional materials, which was guided by the following research questions:

1. How do pre-service English teachers report their digital competencies regarding the design of PACIFIC-based interactive instructional materials?
2. What challenges do pre-service English teachers encounter in creating PACIFIC-based interactive instructional materials?

## 2. LITERATURE REVIEW

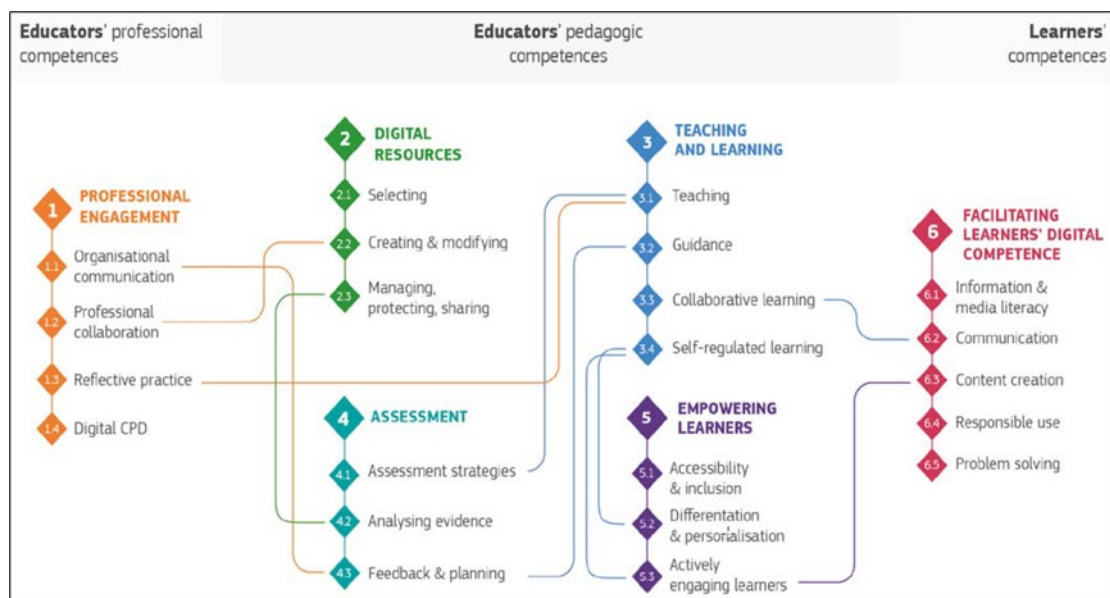
### 2.1 Digital Competence in Education

Gilster (1997) define digital competence as the capability to understand and use information effectively across various formats from diverse sources and tools. Eshet (2004) categorizes digital competence into five distinct categories: (a) photo-visual literacy, the ability to read and create symbols beyond text; (b) reproductive competence, the skill to generate combinations from existing information; (c) information literacy, the capacity to critically evaluate online content; (d) branched literacy, the ability to navigate Internet hypertext and multimedia sources; and (e) socioemotional competence, the essential skill for online communication and collaboration. In the educational context, Ng (2012) defines digital competence as the technical and operational skills, pedagogic abilities (e.g., the capacity to use technology for learning and daily activities), cognitive abilities (e.g., the ability to evaluate, search, create, and critically analyze digital information), and socio-emotional competencies (e.g., the ability to use ICT for responsible communications, teamwork, and other social learning objectives) of educators. This current study views digital literacy as encompassing the knowledge, skills, abilities, and attitudes required for educators, including teacher trainees, to use computers, technology, and the Internet to navigate information, collect data, analyze information, and apply the

information for pedagogical purposes. Digitally literate educators are those who can read and use multimedia, understand hypermedia texts, find and critically evaluate information, and collaborate to communicate information effectively (Hatlevik et al., 2015; Pettersson, 2018).

## 2.2 Digital Competence of Educators

The DigCompEdu framework (Redecker, 2017) is a comprehensive guideline for enhancing digital competencies in the educational realm, as delineated in studies that promote its applicability across various educational contexts (Cabero-Almenara et al., 2020; Caena & Redecker, 2019). As illustrated in Figure 1, this framework, which is pivotal in shaping digital literacy courses, delineates six domains that collectively address the multifaceted nature of educators' digital competencies (Redecker, 2017).



**Figure 1.** DigCompEdu competencies and their relationships (Redecker, 2017, p. 16).

Figure 1 presents a framework depicting the relationship between educators' professional competencies, pedagogic competencies, and learners' competencies. Educators' professional competencies encompass professional engagement, which includes organizational communication, professional collaboration, reflective practice, and digital continuous professional development (CPD); meanwhile, educators' pedagogic competencies consist of competencies related to digital resources, teaching and learning, assessment, and empowering learners; and learners' competencies include facilitating learners' digital competence that is associated with information and media literacy, communication, content creation, responsible use, and problem-solving. The above figure uses color-coded lines to connect related sub-components across these areas, illustrating how educators' competencies underpin and are integral to fostering learners' digital competencies.

### *2.2.1 Professional engagement*

Professional engagement emphasizes the educators' commitment to utilizing digital tools for professional development and effective engagement in educational settings (Redecker, 2017). This domain emphasizes the significance of educators as proactive members within their institutions, leveraging digital technology for collaboration, reflective practice, and continuous professional growth. It highlights the symbiotic relationship between educators' professional growth and their digital competence, suggesting that educators' ability to integrate digital tools into their practice reflects their overall professional development.

### *2.2.2 Digital resources*

Digital resources encapsulate the skills of selecting, creating, modifying, and managing digital materials (Redecker, 2017). Competence in this area ensures educators can effectively curate and tailor digital resources for teaching and learning enhancement, embodying the crucial role of digital literacy in educational material curation (Redecker, 2017). This domain interlinks with teaching and learning as the ability to select and modify resources directly influences the design and implementation of digital learning experiences. Digital competence, in fact, must be supported with the ability to effectively protect sensitive digital content and appropriately apply privacy and copyright rules. Educators also need to understand issues around the use and creation of educational open licenses and resources, including their associated attribution (Redecker, 2017).

### *2.2.3 Teaching and learning*

Teaching and learning, as a domain, delves into the application of digital tools to foster effective instruction and student engagement (Redecker, 2017). This area connects deeply with digital resources and assessment, illustrating a triadic relationship in which the selection of digital resources influences teaching methodologies, which in turn shapes assessment practices (Redecker, 2017). The integration of digital technologies in teaching not only enhances pedagogical approaches but also facilitates innovative and student-centered learning environments.

### *2.2.4 Assessment*

The assessment domain encompasses the adept use of digital tools for evaluating and providing feedback on students' learning (Redecker, 2017). This area is inherently linked to teaching and learning since the methods and tools used for assessment influence the instructional design and vice versa (Arrafii, 2021; Redecker, 2017). Effective assessment practices, underpinned by digital competencies, enable educators to provide timely feedback and adapt teaching strategies based on data-driven insights, fostering a responsive educational environment. In addition, teachers are recommended to employ digital technology to promote and support learner agency (Burhanuddin & Arrafii, 2023) through developing self-regulated learning abilities, i.e., to empower learners to plan, control, and reflect on their own learning.

### *2.2.5 Empowering learners*

Empowering learners focuses on leveraging digital technology to support inclusivity, differentiation, and active engagement (Redecker, 2017). This domain is intrinsically connected to teaching and learning as well as assessment domains, as the empowerment of learners through digital means requires thoughtful instructional designs and assessment practices that recognize and address diverse learners' needs (Redecker, 2017). It emphasizes the role of digital technologies in creating accessible learning opportunities which cater to individual learning styles and needs.

### *2.2.6 Facilitating learners' digital competence*

Lastly, facilitating learners' digital competence aims at developing students' abilities in information literacy, digital creation, communication, and problem-solving (Redecker, 2017). This domain not only complements but also extends the implications of the teaching and learning domain since it focuses on fostering the students' digital literacy and autonomy (Redecker, 2017). By empowering the students with digital skills, educators could facilitate a more profound and self-directed learning experience, encouraging them to engage critically and creatively with digital content.

## **2.3 PACIFIC Program Application**

The DigCompEdu framework (Redecker, 2017) was adopted as a guideline to develop the PACIFIC application as a study guide for the Digital Literacy and Technology in Education courses at Universitas Mulawarman (English-Study-Program, 2020, 2021). The DigCompEdu framework was utilized because it is considered comprehensive and has been used internationally within various educational contexts (Cabero-Almenara et al., 2020; Caena & Redecker, 2019). The PACIFIC application, a combination of seven distinct digital applications, serves as a cornerstone of digital literacy education within the English Study Program (English-Study-Program, 2020, 2021). Each application in the PACIFIC is tailored to augment different facets of digital literacy, demonstrating a multifaceted approach to technology-enhanced learning, as illustrated in Figure 2.

Figure 2 illustrates a multilayered circular model representing PACIFIC as the digital tool for enhancing literacy skills. At the center are icons for seven digital tools—PowerPoint, Audacity, CapCut, Inknoe ClassPoint (ICP), Filmora, Internet, and Canva—encapsulated within an oval titled 'PACIFIC', in which each is described below. Surrounding the center are concentric circles categorizing broader literacy types, such as Internet Literacy, Visual Literacy, and Media Literacy. The outermost bands categorize overarching competencies such as Digital Literacy, Content Creation, and TPACK, suggesting a structured approach to developing digital skills through the use of PACIFIC application tools.

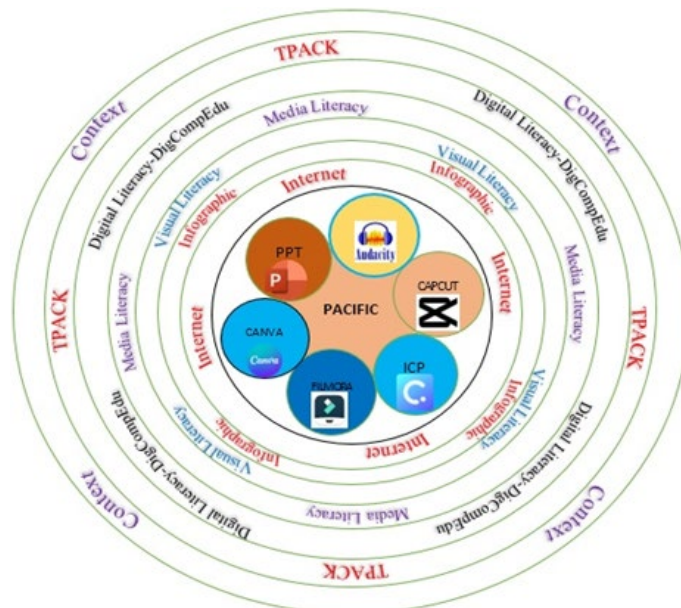
PowerPoint (PPT) emerges as a cost-effective tool that enhances lecture organization and clarity, aiding both students and educators in the assimilation and retention of knowledge through visual and graphic elements (Knight et al., 2018; Uzun & Kilis, 2019). Its ability to incorporate multimedia elements, including movies and dynamic images, makes it a versatile tool for summarizing and emphasizing critical information. Audacity, a free or open-source digital audio editing and recording software, offers functionalities for recording, editing, and exporting audio, enabling the creation of high-quality digital resources. This tool is particularly beneficial in the

educational domain, where it supports diverse learning needs, including aiding hearing-impaired students through enhanced audio content (Chaikovska, 2020).

CapCut provides an intuitive interface for video editing that is suitable for both mobile and desktop environments. Its ease of use and array of features, including text overlays and special effects, facilitate teachers in creating engaging educational videos, thereby enhancing the digital learning experience (Boelan et al., 2022). Inknoe ClassPoint (ICP) integrates with PowerPoint to transform presentations into interactive learning experiences. This tool fosters real-time engagement through quizzes and live answer collections and enhances participation, making it a vital asset in English language classes (Hussein & Akram, 2022). Filmora stands out for its ability to craft infographic videos, providing a suite of editing tools that include effects, transitions, and overlays. This application is instrumental in creating compelling visual content that supports the pedagogical process (Hasanudin et al., 2019).

The Internet, within PACIFIC, broadens digital literacy with platforms such as Pinterest, Piktochart, and Google Docs. These resources are crucial for educators and students to access and create relevant content in ESL and EFL contexts (Lee, 2019; Peng, 2019; Pham & Li, 2022; Tour, 2020). Canva, known for its user-friendly interface, is pivotal for designing educational materials, from presentations to instructional videos. Its collaborative features offer digital literacy and create a dynamic learning environment (Haake, 2021; Hadi et al., 2021; Luterbach, 2022).

The PACIFIC tools exemplify a comprehensive approach to digital literacy education, where each tool contributes uniquely to creating, disseminating, and interacting digital content. This integration of diverse technological tools within a singular educational framework enriches the learning experience and equips students and educators with the requisite digital competencies to navigate and thrive in a digitally driven academic landscape.



**Figure 2.** Application of PowerPoint, Audacity, CapCut, Inknoe ClassPoint, Filmora, Internet, and Canva.

## **2.4 Pre-Service Teachers' Digital Literacy and Competence**

Digital literacy and competence among pre-service teachers in EFL contexts have garnered increasing interest in recent research. Studies have investigated various aspects of pre-service teachers' digital literacy, including their perceptions, competencies, readiness, and practices in integrating digital technology into teaching. Nabhan's (2021) study, focusing on pre-service teachers' conceptions and competencies regarding digital literacy in an EFL academic writing setting, emphasized the significance of understanding pre-service teachers' beliefs related to digital literacy. Similarly, Eryansyah et al. (2020) explore the readiness of EFL pre-service teachers to integrate digital technology into teaching by assessing their current digital literacy competence and the factors influencing its development during undergraduate studies. The study shows that pre-service EFL teachers' digital literacy was above acceptable level even though hindered by limited resources and lack of training.

Studies by Riski et al. (2021) and Prachagool et al. (2022) examine the impact of digital literacy on pre-service teachers during the COVID-19 pandemic. Riski et al. (2021) specifically focus on EFL pre-service teachers' digital footprints during online service learning. The study indicates that pre-service teachers actively used digital skills and literacy for community development, creating valuable online content with various applications. At the same time, Prachagool et al. (2022) highlight the importance of digital literacy in ensuring the quality of education in the future. Moreover, research by Faizah and Rahayu (2019) and Laeli et al. (2022) evaluated pre-service teachers' digital literacy skills and practices. Laeli et al. (2022) explain that EFL pre-service teachers demonstrated a high level of online reading strategy use. Faizah and Rahayu (2019) assess pre-service teachers' digital literacy based on indicators such as Internet searching and content evaluation. The study shows that digital literacy among pre-service teachers improved significantly through the digital literacy course, with average scores reaching 85 in various digital skills.

Despite the existing research on pre-service teachers' digital literacy in EFL contexts, there are still gaps in the literature, which this paper aims to contribute to fill in the literature. Such gaps include further exploration of how digital literacy is integrated into EFL teacher education programs, the specific digital competencies required for effective EFL teaching, and the best practices for enhancing pre-service teachers' digital literacy skills in EFL contexts (Redecker, 2017).

## **2.5 Challenges Pre-Service Teachers Face in Developing Digital Instructional Materials**

Digital instructional materials are essential in modern education, necessitating pre-service teachers to acquire competencies in utilizing technology effectively. However, various studies have highlighted the challenges faced by pre-service teachers in this regard. The literature indicates that pre-service teachers encountered difficulties in creating digital instructional materials due to factors such as limited ICT competencies, challenges in integrating digital tools effectively, and uncertainties in using digital tools during unprecedented situations like the COVID-19 pandemic (Özüdoğru & Cakir, 2020; Paetsch & Drechsel, 2021). Tondeur et al. (2015) stress the significance of assessing pre-service teachers' ICT competencies to meet the demands



of 21st-century education, emphasizing the need for them to have sufficient digital skills to create instructional materials effectively. [Özüdoğru and Cakir \(2020\)](#) examine pre-service teachers' perspectives on using digital tools in literacy education, noting that while using digital tools is seen as engaging, pre-service teachers may struggle to integrate this method into their teaching practices.

[Paetsch and Drechsel \(2021\)](#), researching the factors influencing pre-service teachers' inclination to use digital learning materials during the COVID-19 pandemic, indicate that the unique circumstances present both opportunities and challenges for pre-service teachers in adopting digital tools for instruction. [Paetsch and Drechsel \(2021\)](#) further express concerns about pre-service teachers' readiness to navigate the challenges in the digital educational landscape, suggesting a potential gap in their preparedness to effectively develop digital instructional materials. [Avifah and Fajri \(2022\)](#) emphasize the importance of exploring pre-service EFL teachers' perceptions of educational video production technology, highlighting a specific challenge in understanding how pre-service teachers engage with video production for educational purposes. Additionally, barriers like a lack of digital competency, resource constraints, and budget limitations have been identified as hindrances to the adoption of digital literacy ([Akil & Mohd Adnan, 2022](#)). Moreover, teacher educators often lack digital resources in curriculum materials to enhance and support student learning ([Paskevicius, 2021](#)). Addressing these challenges necessitates support and training to enhance pre-service teachers' digital literacy and competence in producing effective instructional materials.

### **3. METHODS**

#### **3.1 Research Design**

Given the focus on describing pre-service English teachers' digital competencies in creating digital instructional materials and the challenges they found in its implementation, this research employed a qualitative descriptive research design by which the researchers aimed to provide deep narrative and textual descriptions of the phenomena under the study ([Gammelgaard, 2017](#)). This current research aimed to deepen our understanding of pre-service teachers' abilities to develop and deliver interactive instructional materials using PACIFIC programs within the DigCompEdu framework and the challenges they found.

#### **3.2 Data Collection Method**

Given the complex nature of digital competence and its multifaceted dimensions, semi-structured focus group discussions were employed as the primary data collection method. These focus groups offered a less intimidating environment than one-on-one interviews and were effective for eliciting a range of perspectives on various issues related to pre-service teachers' competency in developing interactive digital instructional materials ([Morgan & Hoffman, 2018](#)).

This study involved thirty participants (21 girls and nine boys, aged between 19-20 years old) who were divided into six groups, each of which each group comprised five students. These participants were recruited through a convenient sampling

technique from two parallel student cohorts at a university known for its robust teacher education program. Each group was tasked with developing digital instructional materials on an assigned topic, which provided a practical framework for applying their theoretical knowledge in a semi-controlled, yet creative, educational setting. The topic for each group was different to avoid homogeneity of visual presentation of the developed materials. Table 1 provides information on participants and the topics of digital materials to develop.

**Table 1.** Group of participants of the study who enrolled in Digital Literacy courses.

Groups	Class cohorts	Group members (initials)	The topic of material designed	Grade levels the materials designed for
1	A	EA, IR, EN RI, RO	Asking and Giving Opinion	XI
2	A	DI, LA, RZ, QN, WT	My Favorite Song	X
3	A	GR, YO, ES, HL, AZ	Greetings and Self-Introduction	X
1	B	ZY, AW, PR, ND, MY	Talking about Self	X
2	B	AF, RS, MA, VS, RY	Accepting and Declining Invitation	X
3	B	SD, YN, MH, FJ, AH	Talking about Plan	X

Data collection with group interviews was conducted after the DL course concluded. It provided space for participants to reflect upon their experience in designing and developing the materials. Zoom meeting was used to conduct and record six focus group interviews with a total of 30 participants. The focus group interviews lasted between 70 to 90 minutes, in which the participants were asked a series of questions, such as:

1. What were your experiences when designing the PACIFIC-based digital instructional materials?
2. To what extent has your digital competence been improved because you attended the courses?
3. Which domains of your digital competence have been mostly improved? Please explain!
4. What worries you about the way PACIFIC is designed, created, and used to help future teachers learn how to use technology?
5. Will you be using PACIFIC for your future teaching? Why?
6. Do you have suggestions for improving PACIFIC and this DL course? Please explain!

### **3.3 Data Analysis Method**

A thematic analysis (Braun & Clarke, 2006) was performed to describe the interview results of pre-service English teachers' competence and challenges in designing interactive instructional materials using PACIFIC. The analysis began with transcription and iterative analysis of pre-service English teachers' responses in the group interviews (Glesne, 2014). After that, the analysis went through the manual coding of the entire data set, and the coding was then highlighted and categorized until the evolving themes were identified. At the end, a description of each theme was written along with the extracts supporting it (Braun & Clarke, 2006; Glesne, 2014). The abbreviation marks were used when citing from the original verbatim source data of the interview. For example, G1-A means that the participant belonged to group 1 of the A class, and G1-B means that the participant belonged to group 1 of the B class. There

were three groups from the A class (G1-A, G2-A, G3-A) and the B class (G1-B, G2-B, G3-B). To ensure the credibility of the analysis and interpretation, each author analyzed the data independently until they reached the general theme. After that, they compared and discussed their work until the final themes were agreed upon.

#### 4. FINDINGS

This section reports on pre-service English teachers' digital competence, written sequentially following six domains of the DigCompEdu framework (professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence). The professional engagement and empowering learner domains, however, were not included because data for these domains in this study were not adequately available. Following this, challenges in designing the digital instructional materials were reported.

##### 4.1 Pre-service English Teachers' Competence in Creating the PACIFIC-based Interactive Instructional Material

###### 4.1.1 *Digital resources*

This study provided evidence of pre-service English teachers' competencies in selecting, creating, and manipulating an array of digital resources, including static and non-static images, as well as other visual objects. The participants also reported a clear understanding of copyright conventions. They further stated that they were proficient in using the Internet and employing various search engines such as Google, YouTube, Pinterest, Canva, and other active websites to access knowledge, skills, content, and digital educational resources. The keyword strategy was the most commonly used method by all groups to identify and locate specific resources online. One participant, AW from G1-B, highlighted her experience:

- (1) I gained a lot of experience using the Internet in all courses, especially Technology in Education last semester. It was very helpful in finding specific information using the keyword strategy that my group and I continued to apply to our topic, 'Talking About Yourself'. (G1B-Q1)

This positive experience was also echoed by MY from G1-B. Besides, all participants emphasized that to find specific information on the Internet, more profound knowledge and skills, particularly an understanding of the topic's specific content, were essential. They recognized the importance of not solely relying on search engines but also using magazines and books to explore and understand the topic of the instructional material. Most pre-service English teachers mentioned the frequent use of Canva to search for, select, and utilize digital resources in developing their English materials, especially because Canva allows for editing, modifying, and displaying digital resources, as well as designing and creating new slides and media from scratch. Moreover, they were well-informed and familiar with various aspects of intellectual property, including creative commons, licensing, copyright, rights reserved, and non-commercial use.

#### *4.1.2 Teaching and learning*

Regarding teaching and learning competencies, all pre-service teachers considered themselves competent to plan and teach using the PACIFIC program. The participants reported several benefits of using PACIFIC, noting that it can support their teaching and learning by helping them become more familiar with their subjects and improve their teaching through interactive presentations. For example, VS from G3-C mentioned that PACIFIC aids in visualizing and translating English lessons creatively. EA from G1-A also shared:

- (2) PACIFIC is just a tool, but digitally visualizing the lesson requires our creativity to understand it more deeply, which then makes it easier for students to grasp. (G1A-Q3)

The participants noted that PACIFIC was used as a guide to enhance and assist interactions with learners, both individually and collectively, within and outside learning sessions. This was facilitated by features, such as 'team competition' in Inknoe ClassPoint, although only G1-A implemented this feature in their project. Moreover, the participants highlighted the role of WhatsApp and Facebook as crucial tools in communicating about the given tasks. They affirmed that collaboration through visual communication is a vital learning tool. They also claimed that they were familiar with using Canva, Google Docs, and WhatsApp to gather opinions on designing, creating, and presenting their group projects. Additionally, PACIFIC was noted to facilitate their self-regulation skills, with groups preferring to use EdPuzzle and Facebook Groups to record themselves, save evidence, share links, and track their progress.

#### *4.1.3 Assessment*

In the assessment domain, competence included the ability to use technology to select assessment strategies, analyze learning evidence, provide feedback, and plan lessons. ICP was the most frequently used application for assessment practices. Pre-service English teachers demonstrated the ability to use all features of ICP and an understanding of other online assessment programs. YO from G3-A stated:

- (3) ICP helped us create an interactive quiz in PowerPoint. We could show the questions in the classroom, provide students with code numbers, administer quizzes, collect their live responses, grade the answers, and save the data. Everything is integrated in ICP, making it ideal for formative assessments to gauge students' understanding of the learning objectives. (G3A-Q2)

Furthermore, other participants also mentioned using ICP, Mentimeter, Slido, and other online tests to collect and store classmates' quiz responses as evidence of progress in both formative and summative assessments. The ability to create digital tools for providing feedback and planning was also demonstrated through the use of Mentimeter, EdPuzzle, Quizizz, Google Docs, Genially, and Liveworksheet. Some participants, such as AF from G2-B, reported using Facebook Group Discussions and WhatsApp to receive feedback and comments from lecturers and classmates. However, all participants expressed some dissatisfaction with the limitations of the free versions of online assessment applications, which only accommodate ten items per quiz.

#### 4.1.4 Facilitating learners' digital competence

This competency involved providing students with digital information, opportunities for digital collaboration, content creation, and problem-solving practice. Participants claimed a degree of confidence in some aspects of this competence. For instance, RZ from G2-A noted:

- (4) Filmora allows us to create videos with a cinematic digital slideshow that features futuristic openers, titles, elements, and glitch overlays during transitions. With Filmora and Capcut, I can include not just text but also animations, symbols, various signaling items, extra audio, and certain transition effects in my videos. (G2A-Q3)

Other participants, such as MH from G3-C and EA from G2-A, expressed confidence in creating digital content and seeking external tutorials that enabled them to solve technical problems, particularly to develop their digital problem-solving skills. ZY from G1-C described:

- (5) The internet, as part of PACIFIC, helps my group and me solve technical problems. We often search trusted and reliable tutorial links on how to solve device issues on YouTube or other active websites. All these links can be shared in our Facebook Group Discussion and WhatsApp Group for classmates to try. I usually save these links on my own Google Sites for later use if I reencounter the same issues. (G1C-Q2)

However, it was difficult to find explicit statements in the pre-service English teachers' responses that directly addressed their ability to create digital teaching materials that provided spaces for information, collaboration, and communication for their future students.

## 4.2 Challenges Encountered by Pre-service English Teachers

Participants reported several challenges in designing and presenting interactive instructional materials, which mainly related to resource issues. Most participants noted that not all applications in PACIFIC, such as ICP, Filmora, Canva, and other Internet apps, are free, except for PPT, CapCut, and Audacity. Consequently, except for a few participants, most of them used the free version of PACIFIC, which limited their access to all features. EA from G1-A expressed:

- (6) ICP is a great app, although I only installed the free version. I saw a friend who could access the full version, which offers billions of free templates, themes, animations, videos, and more. (G1-A, Q4 and Q5)

Other challenges include limited time for designing and creating materials and obtaining detailed feedback from lecturers. A lack of practical guidance from lecturers was also noted. RZ from G2-A shared her experience:

- (7) My groupmates and I designed and developed lesson plans, sometimes online and sometimes face-to-face. During face-to-face meetings, we had less time to receive directions, input, and the right model in terms of preparing teaching steps so that they could be structured and implemented effectively and efficiently. Some guidance is still in terms of theory, and only a few examples of teaching models are shown in class. (G2-A, Q4)

AF from G2-C also mentioned challenges related to limited Internet connectivity when implementing the PACIFIC materials:

- (8) When the Internet is limited, especially when running quizzes or tests with ICP, the appearance of the slides on the teacher's PPT will differ from what appears on the participants' cell phones or laptop screens, and we take a long time to refresh our devices to reconnect with ICP. (G2-C, Q4)

## **5. DISCUSSION**

This study discovered that all participants reported having an adequate understanding and competencies necessary for utilizing the PACIFIC application software in creating digital instructional materials across almost all aspects of the DigCompEdu framework, particularly in 'digital resources', 'teaching and learning', 'assessment', and 'facilitating learners' digital competence' dimension. These competencies enabled them to effectively plan, create, teach, and assess using PACIFIC applications. This finding corroborated with earlier research highlighting the positive impact of the PACIFIC program in boosting pre-service teachers' digital literacy (Redecker, 2017). The integration of PACIFIC into the Digital Literacy courses provided pre-service English teachers with the opportunity to experiment with and enhance their use of digital resources, thereby increasing their technological comfort (Gudmundsdottir & Hatlevik, 2018; Hatlevik et al., 2015; Pettersson, 2018). Moreover, these courses emphasized the importance of respecting and correctly implementing copyright and data protection laws, including proper attribution (Redecker, 2017), in an English classroom setting.

This paper argued that the digital literacy (DL) topic has provided clear guidelines and effective strategies for setting up the technological knowledge and digital literacy development of pre-service teachers (Ramírez-Montoya et al., 2017). The findings collectively may suggest that pre-service English teachers in this study have transitioned from mere consumers to proficient creators of digital teaching materials. This shift was crucial in education, as highlighted by Johnson et al. (2014), emphasizing the need for pre-service teachers to evolve from consumers to creators of digital educational media. They have developed the competencies required to analyze, evaluate, and synthesize special infographic videos to enhance English lessons using PACIFIC visually.

Furthermore, this study confirmed that the pre-service English teachers' DigCompEdu competencies have developed, as evidenced by the quality of the teaching materials they produced (Redecker, 2017). More specifically, they reported the ability to use functional skills as part of their DigCompEdu skills and competencies to create and modify digital content, redesign or repurpose digital content for reuse (Hockly, 2012), and develop effective assessment strategies, all of which were validated in this research.

Despite the considerable level of competence claimed by participants in designing PACIFIC-based digital instructional materials, they reported several issues and challenges during the production process. These challenges were primarily associated with resource constraints. This finding was not unexpected given the study's context was in an under-resourced environment where digital tools and equipment, as well as premium subscriptions to online software, remained prohibitively expensive and were unaffordable for many educational institutions and

teacher trainees (Özüdoğru & Cakir, 2020). In tackling these challenges, participants often had to rely on the free versions of software, which limited their access to advanced features and tools that could significantly enhance the educational value of their materials. This situation generated the digital divide that can affect the quality of teacher preparation and, subsequently, the educational experiences provided to students. The reliance on free resources often requires creative solutions, which may foster a certain level of problem-solving skills, but may not always provide the most effective or efficient means to achieve educational goals (Redecker, 2017). Additionally, the findings from the study highlighted the importance of ongoing support and training for pre-service English teachers in using digital tools and resources, supporting evidence reported by other scholars (e.g., Akil & Mohd Adnan, 2022).

These findings altogether implicated that continuous professional development in digital literacy and technology integration is crucial for enabling future educators to effectively incorporate digital resources into their teaching practices (Paskevicius, 2021). Such training should focus on the technical aspects of using digital tools and pedagogical strategies that leverage technology to enhance learning outcomes. Moreover, the experiences gained from navigating and overcoming challenges reported by participants of this study also offered valuable insights into the resilience and adaptability of pre-service English teachers. It illustrated their commitment to overcome obstacles and their ability to innovate under constraints. These qualities are essential for educators in the 21st century.

However, educational policymakers and institution leaders must consider these challenges and work towards providing more robust support systems and resources. This would ensure that all pre-service teachers have equitable access to the tools and training necessary to fully develop their competencies. In addition to showing advancements in the digital competencies of pre-service English teachers facilitated by structured educational programs, this study highlighted the critical need for better resource allocation and support. Addressing these needs will enhance the training of future educators and contribute to the broader educational landscape, particularly by equipping teachers with the necessary resources and skills to foster a digitally literate student population. As the demand for digital competence continues to grow, the education sector must keep pace, ensuring that its educators are well-prepared to meet these challenges.

## 6. CONCLUSION

This paper describes pre-service English teachers' reported abilities and the challenges they encountered while designing interactive digital learning materials using the PACIFIC application. Pre-service English teachers reported sufficient competencies in creating interactive classroom materials with the PACIFIC program. They appeared to have acquired an adequate level of competencies across four domains of digital competencies outlined in the DigCompEdu framework, although some competencies were not covered, e.g., competence to provide spaces for information, collaboration, and communication for their future students. This deficiency of evidence may be due to a lack of deeper elicitation during the interview, which is one of the limitations of this study. The findings reported here advocate for

the extension of digital courses into the pre-service teacher education curriculum, allowing them further opportunities to extend their digital capacities beyond what the curriculum prescribes. In other words, more subjects related to digital literacy should be offered. Additionally, both pedagogical and logistical support for pre-service teachers must be increased in number and quality to enhance their digital skills without being constrained by resources.

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## REFERENCES

- Akil, W. F. H. W. M., & Mohd Adnan, A. H. (2022). Promoting digital literacy in higher education: Case study of a medical laboratory program in Malaysia. *International Journal of Academic Research in Progressive Education and Development*, 11(4), 735-755. <https://doi.org/10.6007/ijarped/v11-i4/15906>
- Arrafii, M. A. (2021). Indonesian teachers' conceptions of values and dimensions of assessment practice: The effect of teachers' characteristics. *Teaching and Teacher Education*, 98, 103245. <https://doi.org/10.1016/j.tate.2020.103245>
- Avifah, I., & Fajri, M. (2022). Pre-service EFL teachers' perception on educational video production technology: A needs analysis. *International Journal of Evaluation and Research in Education*, 11(3), 1407-1415. <https://doi.org/10.11591/ijere.v11i3.21149>
- Boelan, E. G., Baunsele, A. B., Kopon, A. M., Tukan, M. B., Leba, M. A. U., & Komisia, F. (2022). Improving the pedagogic competence of Pandhega Jaya Christian High School teachers through making learning videos. *Abdimas: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang*, 7(3), 508-518. <https://doi.org/10.26905/abdimas.v7i3.7587>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Burhanuddin, & Arrafii, M. A. (2023). Unfolding the typology and quality of the learner agency practices in the teachers' implementation of the 2013 curriculum in Indonesia: The normalisation process theory perspective. *Asia Pacific Education Review*, 24, 545-561. <https://doi.org/10.1007/s12564-022-09806-0>
- Cabero-Almenara, J., Gutiérrez-Castillo, J.-J., Palacios-Rodríguez, A., & Barroso-Osuna, J. (2020). Development of the teacher digital competence validation of digcompedu check-in questionnaire in the university context of Andalusia (Spain). *Sustainability*, 12(15), 6094. <https://doi.org/10.3390/su12156094>
- Caena, F., & Redecker, C. (2019). Aligning teacher competence frameworks to 21st-century challenges: The case for the European Digital Competence Framework



- for Educators (Digcompedu). *European Journal of Education*, 54(3), 356-369. <https://doi.org/10.1111/ejed.12345>
- Chaikovska, O. (2020). The impact of podcasts designed through audacity on improving grammar skills. *Open Educational E-Environment of Modern University*, 8, 1-7. <https://doi.org/10.28925/2414-0325.2020.8.1>
- Costa, G. D. S., & Xavier, A. C. (2016). Critical visual literacy: The new phase of applied linguistics in the era of mobile technology. In A. Pareja-Lora, C. Calle-Martínez, & P. Rodríguez-Arancón (Eds.), *New perspectives on teaching and working with languages in the digital era* (pp. 201-212). Research-publishing.net. <https://doi.org/10.14705/rpnet.2016.tislid2014.434>
- Elstad, E., & Christophersen, K. A. (2017). Perceptions of digital competency among student teachers: Contributing to the development of student teachers' instructional self-efficacy in technology-rich classrooms. *Education Sciences*, 7(1), 27. <https://doi.org/10.3390/educsci7010027>
- English-Study-Program. (2020). *The guideline of technology in education and computer and mobile assisted on language learning courses*. Universitas Mulawarman.
- English-Study-Program. (2021). *The guideline of digital literacy in education course*. Universitas Mulawarman.
- Eryansyah, E., Petrus, I., Indrawati, S., & Ernalida, E. (2020). Pre-service EFL teachers' digital literacy and factors affecting digital literacy development. *Indonesian Research Journal in Education*, 4(2), 402-412. <https://doi.org/10.22437/irje.v4i2.10892>
- Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, 13(1), 93-106.
- Fadzil, H. M. (2018). Designing infographics for the educational technology course: Perspectives of pre-service science teachers. *Journal of Baltic Science Education*, 17(1), 8-18. <https://doi.org/10.33225/jbse/18.17.08>
- Faizah, U., & Rahayu, D. (2019). Enhancing the digital literacy of pre-service biology teachers through animal systematics course. In A. Sofro, E. Hariyono, & S. C. Wibawa (Eds.), *Proceedings of the Mathematics, Informatics, Science, and Education International Conference (MISEIC 2019)* (pp. 170-174). Atlantis Press. <https://doi.org/10.2991/miseic-19.2019.46>
- Ferrari, A., Punie, Y., & Redecker, C. (2012). Understanding digital competence in the 21<sup>st</sup> century: An analysis of current frameworks. In A. Ravenscroft, S. Lindstaedt, C. D. Kloos, & D. Hernández-Leo (Eds.), *The 21<sup>st</sup> century learning for 21<sup>st</sup> century skills* (pp. 79-92). Springer. [https://doi.org/10.1007/978-3-642-33263-0\\_7](https://doi.org/10.1007/978-3-642-33263-0_7)
- Gammelgaard, B. (2017). Editorial: The qualitative case study. *The International Journal of Logistics Management*, 28(4), 910-913. <https://doi.org/10.1108/IJLM-09-2017-0231>
- Gilster, P. (1997). *Digital literacy*. Wiley Computer Pub.
- Glesne, C. (2014). *Becoming qualitative researchers: An introduction* (5<sup>th</sup> ed.). Pearson.
- Gudmundsdottir, G. B., & Hatlevik, O. E. (2018). Newly qualified teachers' professional digital competence: Implications for teacher education. *European Journal of Teacher Education*, 41(2), 214-231. <https://doi.org/10.1080/02619768.2017.1416085>

- Haake, A. B. (2021). *The language teacher rebel: A guide to building a successful online teaching business*. Teach Yourself.
- Hadi, M. S., Izzah, L., & Paulia, Q. (2021). Teaching writing through Canva application. *Journal of Languages and Language Teaching (Online)*, 9(2), 228-235. <https://doi.org/10.33394/jollt.v9i2.3533>
- Hasanudin, C., Fitriainingsih, A., & Saddhono, K. (2019). The use of Wondershare Filmora version 7.8.9 media apps in flipped classroom teaching. *Review of Computer Engineering Studies*, 6(3), 51-55. <https://doi.org/10.18280/rces.060301>
- Hatlevik, O. E., Ottestad, G., & Throndsen, I. (2015). Predictors of digital competence in 7<sup>th</sup> grade: A multilevel analysis. *Journal of Computer Assisted Learning*, 31(3), 220-231. <https://doi.org/10.1111/jcal.12065>
- Hockly, N. (2012). Digital literacies. *ELT Journal*, 66(1), 108-112. <https://doi.org/10.1093/elt/ccr077>
- Hoechsmann, M., & Poyntz, S. R. (2012). *Media literacies: A critical introduction* (1<sup>st</sup> ed.). Blackwell Publishing.
- Hussein, A., & Akram, H. (2022). An empirical study of ClassPoint tool application in enhancing EFL students' online learning satisfaction. *Systems (Basel)*, 10(5), 154. <https://doi.org/10.3390/systems10050154>
- Johnson, L., Adams Becker, S., Estrada, V. & Freeman, A. (2014). *NMC Horizon Report: 2014 K-12 Edition*. The New Media Consortium.
- Khachatryan, A. (2021). The stairway to fairness: Copyright and creativity in the digital age. *University of Denver Sports & Entertainment Law Journal*, 25(23), 24-79.
- Knight, E., Paroutis, S., & Heracleous, L. (2018). The power of PowerPoint: a visual perspective on meaning making in strategy. *Strategic Management Journal*, 39(3), 894-921. <https://doi.org/10.1002/smj.2727>
- Kukulka-Hulme, A., Lee, H., & Norris, L. (2017). Mobile learning revolution: Implications for language pedagogy. In C. A. Chapelle & S. Sauro (Eds.), *The Handbook of technology and second language teaching and learning* (pp. 217-233). John Wiley & Sons. <https://doi.org/10.1002/9781118914069.ch15>
- Laeli, A., Setiawan, S., & Anam, S. (2022). EFL pre-service teachers' online reading strategy use and their insight into teaching reading. *International Journal of Learning Teaching and Educational Research*, 21(10), 139-160. <https://doi.org/10.26803/ijlter.21.10.7>
- Lee, Y. J. (2019). Integrating multimodal technologies with VARK Strategies for learning and teaching EFL presentation: An investigation into learners' achievements and perceptions of the learning process. *Australian Journal of Applied Linguistics*, 2(1), 17-31. <https://doi.org/10.29140/ajal.v2n1.118>
- Luterbach, K. J. (2022). *Creating Stellar lessons with digital tools: From integration to innovation in technology-enhanced teaching*. Routledge.
- Mayer, R. E. (Ed.). (2014). *The Cambridge handbook of multimedia learning* (2<sup>nd</sup> ed.). Cambridge University Press. <https://doi.org/10.1017/CBO9781139547369>
- McGarr, O., & McDonagh, A. (2021). Exploring the digital competence of pre-service teachers on entry onto an initial teacher education programme in Ireland. *Irish Educational Studies*, 40(1), 115-128. <https://doi.org/10.1080/03323315.2020.1800501>

- Morgan, D. L., & Hoffman, K. (2018). *The SAGE handbook of qualitative data collection*. SAGE Publications Ltd. <https://doi.org/10.4135/9781526416070>
- Nabhan, S. (2021). Pre-service teachers' conceptions and competences on digital literacy in an EFL academic writing setting. *Indonesian Journal of Applied Linguistics*, 11(1), 187-199. <https://doi.org/10.17509/ijal.v11i1.34628>
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education*, 59(3), 1065-1078. <https://doi.org/10.1016/j.compedu.2012.04.016>
- Özüdoğru, G., & Cakir, H. (2020). An investigation into the opinions of pre-service teachers toward uses of digital storytelling in literacy education. *Participatory Educational Research*, 7(1), 242-256. <https://doi.org/10.17275/per.20.14.7.1>
- Paetsch, J., & Drechsel, B. (2021). Factors influencing pre-service teachers' intention to use digital learning materials: A study conducted during the COVID-19 pandemic in Germany. *Frontiers in Psychology*, 12, 733830. <https://doi.org/10.3389/fpsyg.2021.733830>
- Paskevicius, M. (2021). Educators as content creators in a diverse digital media landscape. *Journal of Interactive Media in Education*, 2021(1), Article 18. <https://doi.org/10.5334/jime.675>
- Peng, J. E. (2019). The roles of multimodal pedagogic effects and classroom environment in willingness to communicate in English. *System*, 82, 161-173. <https://doi.org/10.1016/j.system.2019.04.006>
- Pettersson, F. (2018). On the issues of digital competence in educational contexts: A review of literature. *Education and Information Technologies*, 23(3), 1005-1021. <https://doi.org/10.1007/s10639-017-9649-3>
- Pham, Q. N., & Li, M. (2022). Digital multimodal composing using visme: EFL students' perspectives. *The Asia-Pacific Education Researcher*, 32, 695-706. <https://doi.org/10.1007/s40299-022-00687-w>
- Prachagool, V., Nuangchalerm, P., & Yawongsa, P. (2022). Digital literacy of pre-service teachers in the period time of Covid-19 pandemic. *Journal of Educational Issues*, 8(2), 347-358. <https://doi.org/10.5296/jei.v8i2.20135>
- Ramírez-Montoya, M. S., Mena, J., & Rodríguez-Arroyo, J. A. (2017). In-service teachers' self-perceptions of digital competence and OER use as determined by a MOOC training course. *Computers in Human Behavior*, 77, 356-364. <https://doi.org/10.1016/j.chb.2017.09.010>
- Redecker, C. (2017). *European framework for the Digital Competence of Educators: DigCompEdu*. Publications Office of the European Union. <https://doi.org/10.2760/159770>
- Richter, J., Scheiter, K., & Eitel, A. (2016). Signaling text-picture relations in multimedia learning: A comprehensive meta-analysis. *Educational Research Review*, 17, 19-36. <https://doi.org/10.1016/j.edurev.2015.12.003>
- Riski, R., Syukri, S., Nurfaidah, S., & Abidin, A. (2021). Our digital footprints during online service learning from home program": EFL pre-service teachers' photovoice analysis. *International Journal of Transdisciplinary Knowledge*, 2(1), 27-41. <https://doi.org/10.31332/ijtk.v2i1.15>
- Starkey, L. (2020). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*, 50(1), 37-56. <https://doi.org/10.1080/0305764X.2019.1625867>
- Tondeur, J., Aesaert, K., Pynoo, B., Braak, J., Fraeyman, N., & Erstad, O. (2015). Developing a validated instrument to measure preservice teachers' ICT

- competences: Meeting the demands of the 21<sup>st</sup> century. *British Journal of Educational Technology*, 48(2), 462-472. <https://doi.org/10.1111/bjet.12380>
- Tondeur, J., Pareja Roblin, N., van Braak, J., Voogt, J., & Prestridge, S. (2017). Preparing beginning teachers for technology integration in education: Ready for take-off? *Technology, Pedagogy and Education*, 26(2), 157-177. <https://doi.org/10.1080/1475939X.2016.1193556>
- Tour, E. (2020). Teaching digital literacies in EAL/ESL classrooms: Practical strategies. *TESOL Journal*, 11(1), e00458. <https://doi.org/10.1002/tesj.458>
- Uzun, A. M., & Kilis, S. (2019). Impressions of pre-service teachers about the use of PowerPoint slides by their instructors and its effects on their learning. *International Journal of Contemporary Educational Research*, 6(1), 40-52. <https://doi.org/10.33200/ijcer.547253>