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Pre-Service English Language Teachers' Digital Competence in Developing Interactive Learning Media

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Abstract

The increasing demand for technology-enhanced instruction in English Language Teaching (ELT) highlights the importance of developing strong digital competence among pre-service teachers, especially in designing interactive learning media. This study aimed to examine how pre-service English language teachers perceived their digital competence in developing interactive learning media during the Field Experience Program (PPL). Consists of 10 participants from the ELESP 2022 cohort at Universitas Negeri Gorontalo. Guided by the DigCompEdu framework, the research focused on three domains closely related to media production and pedagogical application: Digital Resources, Teaching and Learning, and Empowering Learners. Using a descriptive qualitative design, data were collected through semi-structured interviews and were analyzed thematically. The findings show that participants possessed fundamental operational skills in using tools such as Canva, PowerPoint, Wordwall, and Baamboozle to create multimodal and gamified activities that enhanced student engagement and comprehension. However, they reported limited expertise in advanced media design, contextual adaptation, and facilitating collaborative digital learning. Challenges were linked to insufficient practical training during coursework, unstable internet access, limited school devices, and dependence on free templates. Despite these constraints, participants expressed strong motivation to improve their digital teaching competence. The study highlights the need for teacher education programs to reinforce experiential digital pedagogy through hands-on workshops and project-based media development to better prepare pre-service teachers for designing inclusive and effective technology-integrated learning environments.

Keywords: Digital competence; DigCompEdu; interactive learning media; pre-service teachers; Field Experience Program; Indonesia.

Introduction

The rapid digitalization of education has transformed pedagogical practices and intensified the demand for technology-enhanced learning in English language teaching (ELT). While teachers are increasingly expected to design interactive, student-centered, and multimodal learning environments, a persistent gap remains between pre-service teachers' theoretical understanding of digital literacy and their ability to apply it meaningfully in classroom practice (Hulu, 2023). This challenge is particularly relevant in Indonesia, where the Merdeka Curriculum emphasizes digital literacy, creativity, and innovative instruction, yet many schools continue to face limited digital infrastructure, with only 55% having stable internet access and around 40% relying on shared devices (Kemendikbudristek, 2024).

Within teacher education programs, digital competence has become a foundational component of professional preparation. Institutions, including the English Language Education Study Program (ELESP) at Universitas Negeri Gorontalo, have integrated digital media courses, practical projects, and technology-enhanced Field Experience Programs (PPL). However, the extent to which these initiatives effectively prepare pre-service teachers to design and implement interactive learning media in authentic school settings remains underexplored. Many pre-service teachers report confidence in operating digital tools yet struggle with instructional design, contextual adaptation, and purposeful pedagogical integration.

Existing studies consistently highlight similar patterns. Research by Basilotta-Gómez-Pablos et al. (2022) and Fernández-Batanero et al. (2022) shows that digital competence enhances engagement and instructional innovation, while Çebi & Reisoglu (2020) and Limbong & Wadham (2024) emphasize that operational skills do not necessarily translate into strategic digital pedagogy. These findings indicate the need for more experiential, practice-oriented digital training and deeper understanding of how pre-service teachers perceive their own digital readiness.

The persistent discrepancy between theoretical digital knowledge and applied digital teaching practices presents a critical gap in teacher education. Despite increased curricular emphasis on digital literacy, pre-service teachers frequently rely on templates, basic media editing features, and surface-level digital strategies. This indicates the need for more experiential, project-based, and practice-driven digital training during teacher education. It also underscores the importance of understanding pre-service teachers' perceptions, as their beliefs, confidence, and prior experiences significantly shape their adoption and implementation of technology in classrooms.

Against this backdrop, the present study examines how pre-service English

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language teachers at Universitas Negeri Gorontalo perceive their digital competence when designing and implementing interactive learning media during their PPL teaching practicum. Guided by key domains of the DigCompEdu framework—Digital Resources, Teaching and Learning, and Empowering Learners—the study explores their self-assessments, learning strategies, challenges, and classroom experiences. This approach offers a nuanced perspective by situating competence development within real classroom contexts rather than simulated academic settings.

To address the identified gap, the study specifically answers the following research questions: "How do pre-service English language teachers perceive their digital competence in developing interactive learning media during PPL?". By investigating the questions, the study aims to generate empirical insights that can guide improvements in teacher education curricula, particularly in strengthening experiential digital pedagogy and supporting pre-service teachers in navigating real-world technological constraints.

Literature Review

Digital Competence in Education

The rapid digitalization of education has reshaped the essential competencies required of teachers in the 21st century. Digital competence refers to the confident, critical, and responsible use of digital technologies for teaching, learning, and professional development (Zhao et al., 2021). In the educational context, it encompasses more than technical proficiency—it includes the pedagogical, ethical, and creative abilities necessary to transform digital tools into meaningful learning experiences.

In teacher education, digital competence serves as a foundation for preparing future educators to adapt to technologically enhanced learning environments. (Redecker & Punie, 2017) through the European Framework for the Digital Competence of Educators (DigCompEdu), conceptualize this competence as a multifaceted construct composed of six dimensions: Professional Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, and Facilitating Learners' Digital Competence. These areas reflect the holistic nature of digital literacy as a professional standard in modern education.

Recent research highlights the increasing relevance of digital competence across disciplines. For example, Basilotta-Gómez-Pablos et al. (2022) found that digitally competent teachers foster higher student motivation and collaborative learning outcomes. Likewise, emphasized the importance of developing educators' digital skills to ensure effective technology integration and inclusion. Within language education, these competencies become critical for promoting learner autonomy, creativity, and intercultural communication.

Digital Competence in English Language Teaching (ELT)

In the field of English Language Teaching (ELT), technology has transformed instructional practices by enabling interactive, multimodal, and learner-centered pedagogies. Teachers are expected not only to use digital tools but to design, adapt, and evaluate them to enhance students' communicative competence and engagement. According to Aulia et al. (2024), the integration of interactive digital media improves language retention, fosters participation, and supports differentiated instruction.

However, effective implementation requires teachers to balance technological skills with pedagogical awareness, a challenge highlighted by Çebi & Reisoglu (2020), who observed that many pre-service teachers demonstrate sufficient digital literacy yet struggle with pedagogical integration. This indicates a significant gap between knowing how to use technology and knowing how to teach effectively with technology.

The TPACK model (Technological Pedagogical Content Knowledge) proposed by Koehler & Mishra (2006) provides a theoretical lens for understanding this integration. It asserts that competent teachers should possess a dynamic interplay between content knowledge, pedagogy, and technology. When applied to ELT, TPACK aligns with DigCompEdu's emphasis on adaptive teaching practices that merge digital innovation with language learning principles.

Interactive Learning Media

Interactive learning media constitute digital or physical tools that encourage learners' active participation and engagement in the learning process. Rather than relying on passive information delivery, these media invite students to manipulate content, make decisions, and receive immediate feedback. Examples include educational software, simulation games, virtual classrooms, and multimedia presentations that allow learners to control the sequence and pace of learning (Anggraeni et al., 2021). In the context of English language teaching, interactive media encompass tools such as Kahoot!, Quizizz, Canva, Google Slides, and Edpuzzle, all of which are designed to reinforce vocabulary, grammar, and listening comprehension through game-based or visual engagement.

In the 21st century, interactive media have become essential components of pedagogy because they encourage student-centered learning and promote engagement across various modalities—visual, auditory, and kinesthetic. The combination of text, graphics, audio, and video creates a multimodal learning environment that caters to diverse learning styles. For instance, Indonesian learners, who tend to prefer visual and auditory learning modes, benefit greatly from animated grammar lessons or video-based vocabulary instruction. Teachers

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can employ narration, podcasts, or embedded questions in videos to enhance auditory engagement, ensuring inclusivity and accessibility for all students.

From a theoretical perspective, the integration of interactive media in education is grounded in several key pedagogical frameworks. Gamification, for instance, represents one of the most influential strategies for promoting motivation and active participation. Defined as the application of game-design elements—such as points, levels, leaderboards, and rewards—in non-game contexts (Deterding et al., 2011), gamification transforms learning into an engaging and competitive process. Platforms like Kahoot!, Quizizz, and Wordwall exemplify this approach by turning conventional exercises into interactive challenges that enhance both enjoyment and achievement. Studies reveal that gamification positively affects students' intrinsic motivation, collaboration, and long-term retention (Wang & Tahir, 2020).

In tandem with gamification, student engagement theory (Fredricks et al., 2004), provides a multidimensional lens to understand how interactive learning fosters deeper learning. Engagement encompasses behavioral, emotional, and cognitive dimensions that reflect students' participation, enthusiasm, and intellectual effort. When interactive media are used, students exhibit increased behavioral engagement through participation, emotional engagement through enjoyment, and cognitive engagement through problem-solving and critical reflection. This tripartite model highlights the importance of designing digital instruction that addresses not only content mastery but also emotional and motivational aspects of learning.

Furthermore, constructivist learning theory strengthens the pedagogical justification for using interactive media. According to McLeod (2025), learning occurs most effectively when students actively construct meaning through experience and collaboration. Interactive tools such as collaborative Canva projects, online discussions, or gamified tasks encourage learners to discover, analyze, and apply concepts rather than memorizing information. This aligns with the constructivist view of the teacher as a facilitator who guides exploration and reflection, a crucial perspective for pre-service English teachers learning to integrate technology in communicative contexts.

The value of interactive learning media also extends to personalized and adaptive learning, where instruction is tailored to learners' individual abilities and progress. Ambele et al. (2022) assert that personalization benefits all learners by accommodating varied learning paces, interests, and competencies. Similarly, adaptive learning technologies use algorithms to modify content difficulty and provide targeted feedback based on student performance (Marienko et al., 2020). For English language instruction, adaptive digital tools allow differentiated vocabulary exercises or grammar tasks that respond to learners' unique challenges,

supporting inclusivity and learner autonomy.

Another critical framework supporting interactive media is the Universal Design for Learning (UDL), which promotes equitable access and engagement for all students. The UDL framework (CAST, 2024). recommends providing multiple means of representation, engagement, and expression to address learner variability. By applying UDL, teachers can ensure that instructional materials—whether text, visuals, or audio—are accessible to students with different linguistic or physical abilities. Oswal et al. (2025) and Navas-Bonilla et al. (2025) emphasize that incorporating UDL principles in digital instruction prepares future teachers to design flexible learning experiences that are inclusive, ethical, and technologically grounded.

Interactive Media in Pre-Service Teacher Education

In the context of teacher education, interactive learning media serve as both pedagogical tools and training grounds for developing digital competence. Pre-service teacher programs must go beyond theoretical instruction by embedding hands-on digital media projects that enhance practical skills. As [3] note, digital literacy training in teacher education should not merely teach software usage but cultivate pedagogical creativity and technological adaptability. Yet, challenges persist. Studies by Çebi & Reisoglu (2020) and Fernández-Batanero et al. (2022) reveal that many pre-service teachers encounter difficulties in translating digital theory into practice due to limited access to technology, insufficient mentorship, and lack of contextualized training.

These barriers are particularly evident among pre-service English language teachers (PELTs), who must simultaneously navigate linguistic, pedagogical, and technological competencies. Limbong & Wadham (2024) found that while most PELTs demonstrate high enthusiasm in using applications such as Canva and Filmora, they often rely on pre-made templates and face connectivity challenges during field practice. This underscores the necessity for institutional support, experiential learning opportunities, and structured mentorship to bridge the gap between digital awareness and pedagogical application.

Moreover, the dimension of digital content creation remains the weakest among educators, as highlighted by Artacho et al. (2020). Without the ability to design original, context-specific digital materials, teachers risk becoming passive consumers rather than active creators. Therefore, teacher education programs should emphasize project-based learning in which pre-service teachers design interactive media aligned with curriculum goals. Such approaches not only develop creativity but also strengthen critical thinking, collaboration, and self-efficacy—key attributes of digitally competent educators.

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In summary, integrating interactive learning media into teacher education offers multiple pedagogical benefits. It fosters engagement through gamification, deepens understanding through constructivist interaction, ensures inclusivity through UDL, and enhances adaptability through personalization. For pre-service English teachers, developing and utilizing interactive media is more than a technological skill—it is a professional competence that reflects innovation, empathy, and responsiveness to learners' diverse needs in a digital world. As teacher education continues to evolve, embedding interactive media within its framework becomes essential to preparing future educators who are digitally fluent, pedagogically creative, and socially inclusive.

Method

Research Design

This study employed a descriptive qualitative design (Creswell, 2014) to explore pre-service English language teachers' perceptions of their digital competence in developing interactive learning media. The qualitative approach was selected because it enables an in-depth examination of participants' experiences, interpretations, and meaning-making processes within authentic educational contexts. Rather than focusing on numerical measurement, this design prioritizes rich explanations and contextual understanding of how teachers conceptualize and apply digital skills during their teaching practice.

Participants and Research Setting

The research was conducted in the English Language Education Study Programme (ELESP) at Universitas Negeri Gorontalo, specifically during the implementation of the Field Experience Program (PPL). 10 pre-service English teachers from the 2022 cohort were selected through purposive sampling. This sampling technique ensured that participants had direct experience in designing and using interactive digital learning media during their school practicum. The inclusion criteria comprised:

1. active enrollment as ELESP students;
2. completion of the teaching practicum; and
3. practical engagement in digital-based media creation.

The participants had an average age of 20–21 years, consisting of 6 females and 4 males. Their PPL placements represented varied educational settings across Gorontalo Regency, including SMA Negeri 1 Suwawa Timur, SMK Negeri 1 Suwawa, SMAS Terpadu Wira Bhakti Gorontalo, and SMP Negeri 1 Tapa. These diverse school placements provided authentic insights into the real conditions of digital resource availability, infrastructure, and classroom implementation.

Data Collection Technique

Data were collected through semi-structured interviews to allow flexibility while maintaining alignment with the study objectives. Interviews were conducted in Bahasa Indonesia for clarity and natural expression, each lasting 30–45 minutes, and audio-recorded with participants' consent.

The interview protocol was developed using three domains of the DigCompEdu framework—Digital Resources, Teaching and Learning, and Empowering Learners—and consisted of 14 open-ended questions. Expert validation was conducted by ELT and educational technology specialists. Member checking was implemented by returning transcripts to participants to ensure accuracy and credibility.

Interview Timeline:

Interviews were conducted shortly after participants completed their PPL duties to ensure recollection accuracy:

1. Interview 1: 26 May 2025, 10.00–11.00 WITA, SMA Negeri 1 Suwawa Timur
2. Interview 2: 27 May 2025, 14.00–15.00 WITA, SMAS Terpadu Wira Bhakti Gorontalo
3. Interview 3: 3 June 2025, 10.00–11.00 WITA, SMK Negeri 1 Suwawa
4. Interview 4: 16 June 2025, 10.00–11.00 WITA, SMP Negeri 1 Tapa

The full interview protocol is provided in the Appendix for transparency and replicability.

Data Analysis Technique

Thematic analysis (Braun & Clarke, 2006) was applied to analyze the interview data using six-step approach: familiarization, coding, theme generation, theme review, theme definition, and reporting. Transcribed interviews were read repeatedly to identify meaningful patterns related to participants' digital competence. Initial codes were generated and categorized into broader thematic constructs corresponding to the DigCompEdu domains. Themes were refined through iterative review to ensure coherence and alignment with the research focus. The analysis emphasized both convergence across participants and unique perspectives to present a comprehensive interpretation of their digital competence development. Throughout the analysis, the researcher-maintained reflexivity to minimize bias and ensure that interpretations remained grounded in participants' actual experiences.

Thematic saturation was achieved with ten participants. The sample size was considered sufficient because the participants shared a homogeneous background—being final-year pre-service English teachers from the same

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institution who had recently completed their Field Experience Program (PPL). The research focus was limited to three DigCompEdu domains, which narrowed the scope of data exploration. Recurrent themes began to appear after the eighth interview, and subsequent interviews no longer produced new insights but instead reinforced existing patterns related to digital tool use, challenges in creating interactive media, and classroom integration. Consistent with methodological guidance in qualitative research, which suggests that saturation in homogeneous samples is typically reached within 6–12 participants, the inclusion of ten participants was deemed adequate to provide depth and completeness to the findings.

Research Ethics

Ethical approval was obtained from the Research Ethics Committee of the Faculty of Literature and Culture, Gorontalo State University. Participants provided written consent via WhatsApp text message after receiving an explanation of the research objectives, confidentiality, and the voluntary nature of participation. Pseudonyms were used to protect participants' identities, and all data—including audio recordings and transcripts—were stored securely and accessed only by the researcher.

Researcher's Role and Reflexivity

The researcher is a pre-service teacher from the same program, which may introduce potential bias due to shared experiences and familiarity with the PPL context. To mitigate this, reflexive strategies were applied throughout the research process, including keeping analytic memos, maintaining awareness of assumptions, and grounding interpretations strictly in participants' statements. The researcher had no supervisory or evaluative relationship with participants, reducing power dynamics and promoting honest responses.

Results

The analysis of interview data revealed a multifaceted understanding of pre-service English teachers' digital competence in developing interactive learning media. Findings are presented according to the DigCompEdu domains examined: Digital Resources, Teaching and Learning, and Empowering Learners.

Digital Resources: Selection, Creation, and Challenges

The findings indicate that most pre-service English teachers frequently used Canva, Wordwall, and Baamboozle as their primary tools in developing interactive learning media. Canva was the most preferred due to its user-friendly interface and flexible design templates, while Wordwall and Baamboozle were used for creating

interactive quizzes and gamified learning.

> *"I use Canva and Wordwall. Canva is used to deliver materials as well as provide educational games, while Wordwall is utilized for quizzes." (Participant 2)*

> *"……I usually use something called Baamboozle. I chose Baamboozle because it looks interesting, has good visuals, is fun, and also competitive because there is a team feature……" (Participant 4)*

Although these platforms were most frequently mentioned, some participants still relied on PowerPoint for its simplicity and familiarity, and explored alternative platforms, including AI-based tools like ChatGPT, as a way to extend their creativity in content development.

> *"I use PowerPoint to make presentations." (Participant 3)*

> *"I also use ChatGPT…to develop games or seek advice on suitable methods." (Participant 6)*

However, challenges emerged in adapting content to suit learners' contexts and in creating original digital materials beyond basic template modification. Several participants admitted relying on ready-made templates and online examples rather than designing media from scratch. They also reported technical constraints, such as limited internet access and paid feature restrictions, particularly during field practice in rural schools.

> *"The biggest challenge is the selection of learning content that relates to students' experiences, and sometimes I have to adjust the material to make it more understandable." (Participant 3)*

> *"I usually rely on templates from Canva and modify them slightly, but I still find it difficult to create original media." (Participant 5)*

> *"I still feel confident in using basic features, such as layouts or organizing text and images. But when it comes to more complex animations, I still can't do it." (Participant 10)*

Several participants expressed that the training provided during their studies was still insufficient. They explained that courses such as Digital Literacy tended to focus more on theory rather than hands-on practice, leaving gaps in practical skills needed for creating digital teaching materials. As a result, they often relied on self-learning through online resources, workshops, or tutorials.

> *"The learning given still feels lacking…we need more practical workshops rather than just theory. To improve my digital skills, I mostly learn*

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independently from the internet." (Participant 1)

"In my view, the preparation from campus was not very deep…especially when we realized that the RPP or module formats in schools differ from what we studied. For digital media, the provision was also very minimal, so we had to learn by ourselves, sometimes even through TikTok tutorials or free online courses." (Participant 10)

Teaching and Learning: Digital Pedagogical Integration and Student Engagement

The findings indicate that most participants integrated digital technology mainly through the use of visual media and interactive platforms. Canva and PowerPoint were frequently mentioned as the primary tools for delivering lesson materials, designing worksheets (LKPD), and visualizing abstract concepts. YouTube and video presentations were also integrated as supporting media to enrich content delivery and strengthen students' comprehension.

"I integrate digital tools into my teaching strategy through the use of PowerPoint as the main medium in delivering the material." (Participant 10)

"I use Canva and Wordwall in my learning. Canva is used to deliver materials as well as provide educational games. (Participant 2)

Based on the interview data, all participants expressed the same belief that the use of digital tools significantly increased student engagement in their classrooms. The pre-service teachers consistently reported that students become more active, enthusiastic, and responsive when using digital media.

"…I feel that the use of digital tools such as the Wordwall website can indeed increase student engagement in the learning process. When using interactive quizzes, students seem more enthusiastic, active in their opinions, and involved in discussion. Previously, they tended to be passive and shy. However, after I inserted the element of games and a reward system, they became more relaxed and enthusiastic..." (Participant 1)

"I strongly feel that technology plays an important role in improving student engagement in learning…I measure student engagement through their responses in class, such as engagement during discussions, participation in activities, and expressions of enthusiasm when digital tools are used. So, in my opinion, technology not only helps deliver the material, but also makes learning more lively, fun, and inclusive." (Participant 4)

"…I think the use of technology greatly increases student engagement in the classroom. I have two quite contrasting experiences: when I don't use technology and when I use it while teaching. When I don't use digital tools, for

> *example, just collecting assignments without any other activities, the classroom atmosphere becomes passive, monotonous, and students look uninterested. However, when I use digital tools such as Baamboozle for ice-breaking, the class atmosphere becomes more lively." (Participant 5)*

However, while digital tools successfully fostered engagement, collaborative digital practices were found to be limited. Due to school regulations that restrict smartphone or laptop usage, pre-service teachers could not implement online collaboration platforms such as Google Docs or Padlet. Instead, collaboration occurred indirectly through group discussions or shared media design using offline tools.

> *"…so far I have never used technology directly for collaboration between students, such as Google Docs for example. This is because the use of digital devices at school is quite limited and is not allowed…" (Participant 3)*

> *"…i have never used technology for collaboration between students because students are not allowed to access devices such as cellphones or laptops." (Participant 4)*

The discussion of this domain reinforces that digital pedagogy among pre-service teachers is still in the developmental phase—characterized by high creativity but limited structural and institutional support. The findings highlight the benefit of embedding technological–pedagogical integration (TPACK) approaches in teacher education programs to strengthen pre-service teachers' reflective use of technology in achieving instructional goals.

Empowering Learners: Adaptation to Learning Styles and Accessibility

Most participants demonstrated awareness of adapting digital media to accommodate students' different learning styles. Visual and auditory learners were primarily targeted through videos, animations, narration, and sound-based media, while kinesthetic engagement was indirectly achieved through classroom-based games or interactive exercises.

> *"… I use technology to display learning materials visually, for example through videos... some are more visually dominant, while others are more responsive to oral explanations." (Participant 1)*

> *"For visual learners, I use Canva and videos to show examples, while for auditory learners, I add short narrations or songs." (Participant 9)*

Nevertheless, inclusive design and accessibility considerations—such as personalized feedback or support for learners with special needs—were largely underdeveloped. This finding suggests that although participants understood the

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concept of learner diversity, their practical implementation remained limited to stylistic variation rather than differentiated pedagogy.

> *"...I have never specifically used digital tools for personalized learning…there are no students with special limitations or different learning needs. Thus, all students get the same treatment and materials..." (Participant 1)*

Some participants, like Participant 3 and Participant 4, gave examples of hypothetical tactics they might use when working with pupils who have particular learning challenges. In order to better customize instructional media, these included adding subtitles, making visuals simpler, and speaking with counselors or support teachers.

> *"...for learning videos, I will include subtitles and narration, and ensure the visuals are not too crowded..." (Participant 3)*

> *"...if I face students with special needs, I will first observe their characteristics, then adjust the media, such as simplifying visuals or adding audio..." (Participant 4)*

Table 1. Summary of Findings and Interpretations Based on DigCompEdu Domains

Domain (DigcompEdu)	Key Findings	Challenges Identified	Interpretations/Implications
Digital Resources	Pre-service teachers frequently used Canva, Wordwall, Baamboozle, and PowerPoint to design learning media. Canva was the most preferred for visual design and interactive content.	Limited media design skills; dependency on templates; unstable internet; paid feature restrictions; minimal technical training.	Digital literacy courses emphasize theory over practice. More hands-on workshops and project-based learning are needed to strengthen media creation and contextual adaptation skills.
Teaching and Learning	Integration of digital tools improved engagement and learning	Difficulty implementing collaborative digital learning due to device	Pre-service teachers show pedagogical awareness of digital use but lack experience with collaborative and reflective digital pedagogy.

	outcomes. Wordwall and Baamboozle increased motivation and participation; visual media enhanced comprehension.	restrictions and school policies.	Integration of TPACK-based modules is recommended.
Empowering Learners	Teachers adapted digital media to visual and auditory learning styles through videos, narration, and simple animations.	Limited knowledge of inclusive design and personalized learning; minimal attention to accessibility and differentiation.	Need to integrate Universal Design for Learning (UDL) principles into pre-service teacher curricula to ensure inclusivity and learner autonomy.

Figure 1. Summary of Findings Based on DigcompEdu Framework

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Discussion

The findings of this study reveal that pre-service English teachers at Universitas Negeri Gorontalo (UNG) possess developing levels of digital competence in designing and implementing interactive learning media. These findings can be discussed across three major domains of the DigCompEdu framework—Digital Resources, Teaching and Learning, and Empowering Learners—while also being interpreted through broader pedagogical theories such as TPACK, Engagement Theory, Constructivism, Gamification, and Universal Design for Learning (UDL).

Digital Resources: Creative Production Remains Limited

The study revealed that participants frequently used Canva, PowerPoint, Wordwall, and Baamboozle, yet most relied heavily on pre-made templates rather than creating original digital materials. This trend indicates that their competence is situated at a functional level within the Digital Resources domain of DigCompEdu, where educators can operate tools but have not yet advanced to modifying or producing pedagogically grounded content.

This finding aligns with Çebi & Reisoglu (2020), Fernández-Batanero et al. (2022), and Basilotta-Gómez-Pablos et al. (2022), who similarly found that pre-service teachers often lack opportunities for hands-on media production. Interestingly, compared with studies in Indonesia—such as Limbong & Wadham (2024)—the pattern remains consistent: teacher education programs tend to emphasize tool familiarization rather than design-based learning.

However, a noteworthy and somewhat unexpected finding emerged: despite limited design skills, several participants expressed high confidence in using templates as "ready-made" solutions, viewing them as time-saving and classroom-efficient. This contrasts with Redecker & Punie's (2017) expectation that developing digital competence requires iterative content creation. The mismatch suggests that institutional and contextual constraints, such as large class sizes and limited training hours, may influence pre-service teachers to prioritize practicality over creativity.

From a TPACK perspective, the results imply that participants' technological knowledge (TK) has not yet been fully integrated with pedagogical and content knowledge. Their reliance on templates reinforces the need for structured digital production workshops where students can practice merging TK, PK, and CK through authentic creation tasks.

Teaching and Learning: Engagement Achieved, Pedagogical Integration Underdeveloped

The study found that digital media significantly enhanced student motivation and engagement, primarily through gamified platforms such as Wordwall and Baamboozle. These tools supported behavioral, emotional, and cognitive engagement, consistent with Engagement Theory (Fredricks et al., 2004) and with findings from Indonesian studies (e.g., Limbong & Wadham, 2024; Aulia et al., 2024), which also reported improvements in student participation when gamification was incorporated.

Yet, despite strong engagement outcomes, deeper pedagogical integration remained limited. Most participants used digital tools to make lessons more interesting rather than to support collaboration, higher-order thinking, or inquiry-based learning. This positions their digital practices at the enhancement rather than transformation level, echoing TPACK challenges frequently reported in Southeast Asian teacher education contexts.

A contextual factor influencing this finding is the restrictive policy in many Indonesian schools that limits student device use. These constraints reduce opportunities for collaboration, peer interaction, and co-creation—key components of the Teaching and Learning domain in DigCompEdu. Thus, the gap observed may be partly systemic rather than solely competence-related.

To strengthen integration, teacher education programs should include microteaching cycles where pre-service teachers design, implement, and reflect on digital lessons. These cycles should explicitly link pedagogical goals with technology use, enabling students to articulate why and how a tool supports specific learning objectives.

Empowering Learners: Awareness of Modalities Without Inclusive Personalization

The findings in the Empowering Learners domain indicate that participants demonstrated awareness of diverse learning styles—particularly visual and auditory—but had not yet developed strategies for inclusive and personalized digital instruction. This limited awareness reflects an early stage of application within Universal Design for Learning (UDL) (CAST, 2024) principles, which advocate for providing multiple means of engagement, representation, and expression.

Although participants employed videos, animations, and sound-based materials to support different modalities, few incorporated adaptive feedback, assistive features, or accessibility considerations for students with learning difficulties. This confirms the argument made by Oswal et al. (2025) and Navas-

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Bonilla et al. (2025) that many teachers understand diversity in theory but struggle to operationalize it digitally. In essence, participants practiced multimodal engagement but not yet inclusive digital differentiation.

Moreover, the results connect to personalized learning frameworks that align with Ambele et al. (2022) and Marienko et al. (2020) that emphasize tailoring instruction to individual learning paths. The absence of adaptive strategies in participants' teaching suggests that pre-service teachers still view technology as a delivery medium rather than as a tool for personalization and empowerment. According to Redecker & Punie (2017), digital competence involves not only using technology effectively but also fostering learner autonomy through flexible, inclusive, and equitable digital practices.

Consequently, teacher education programs should include explicit training on UDL-based digital design to equip future teachers with strategies for accessibility and adaptive learning. Such initiatives would cultivate empathy, ethical awareness, and social responsibility—dimensions increasingly regarded as integral to digital competence in 21st-century education.

Theoretical Implications

The findings contribute to DigCompEdu and TPACK literature in several ways:

1. They demonstrate that digital competence development in Indonesian teacher education is strongly influenced by contextual constraints (e.g., school policies, infrastructure limitations), an area underrepresented in earlier DigCompEdu applications.
2. They highlight that engagement-oriented technology use may precede pedagogically integrated use, suggesting a staged progression of competence not fully captured in existing TPACK models.
3. They show that template-based media creation, while often criticized, may serve as an intermediary step in competence development—an insight that can inform adaptations of DigCompEdu for low-resource contexts.

Practical Recommendations

To address the gaps identified, teacher education programs should consider the following:

1. Integrate 8–12 hours of hands-on digital media production workshops per semester focusing on design, modification, and contextual adaptation of materials.
2. Embed UDL-based digital design modules that train students to create

accessible and differentiated materials.
3. Implement structured microteaching cycles where pre-service teachers plan, deliver, and reflect on digitally enhanced lessons.
4. Expand partnerships with local schools to allow supervised digital teaching practice despite device restrictions.
5. Align digital competence training with national curriculum standards, ensuring continuity between campus training and classroom realities.

These steps offer concrete, actionable improvements that address both competence and contextual challenges.

Limitations of the Study

This study has several limitations that warrant acknowledgment.

1. First, the sample consisted of only ten pre-service teachers from a single institution, which may restrict the generalizability of the findings.
2. Second, the research focused solely on three DigCompEdu areas—Digital Resources, Teaching and Learning, and Empowering Learners—excluding other relevant domains such as Assessment and Professional Engagement.
3. Third, the findings reflect contextual constraints during PPL, such as inconsistent school infrastructure and digital policies, which may affect the extent of technology integration.
4. Fourth, the study relied exclusively on interviews without triangulation through observation or document analysis. Future research should consider involving larger and more diverse samples, incorporating mixed-method designs, exploring additional digital competence dimensions, and triangulating data to enhance reliability and depth.

Future Research Direction

Future studies could explore:

1. Longitudinal development of digital competence from early semesters to teaching practicum.
2. The impact of mandatory digital design workshops on pre-service teachers' creativity and pedagogical integration.
3. Comparisons across universities in Indonesia to identify regional or institutional differences.
4. The role of school-level policies and infrastructure in shaping digital competence trajectories.
5. Digital competence development through AI-based tools, which are increasingly prevalent in classrooms.

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Conclusion

This study concludes that interactive learning media play a crucial role in shaping pre-service English language teachers' digital competence and pedagogical readiness for 21st-century classrooms. Through the integration of digital tools—such as Canva, Wordwall, Quizizz, and Edpuzzle—pre-service teachers develop not only technical skills but also pedagogical creativity, critical reflection, and adaptive instructional design. The findings emphasize that digital competence is not limited to operating technology; rather, it encompasses the ability to design, evaluate, and apply digital resources that enhance student engagement, inclusivity, and learning outcomes.

The literature synthesis demonstrates that the use of interactive learning media aligns with several theoretical foundations, including gamification, constructivist learning, student engagement theory, and Universal Design for Learning (UDL). These frameworks collectively highlight that active participation, personalized learning, and accessibility are fundamental to effective technology integration. By implementing these principles, teacher education programs can bridge the persistent gap between digital theory and classroom practice, helping pre-service teachers move from digital awareness toward digital fluency.

However, the research also reveals ongoing challenges—such as limited institutional support, uneven access to digital resources, and insufficient training on media creation and pedagogical application. Many pre-service English teachers still rely on ready-made templates or experience difficulties contextualizing technology for communicative learning. These issues underscore the importance of embedding structured, project-based digital training within teacher education curricula, supported by mentorship and reflective assessment.

Ultimately, developing digital competence through interactive media is not merely a technological demand but a professional responsibility. It prepares pre-service English teachers to design inclusive, learner-centered, and innovative educational environments that reflect both pedagogical depth and digital adaptability. As education systems continue to transform globally, the integration of interactive learning media into teacher education serves as a pathway toward producing educators who are not only digitally skilled but also creative, inclusive, and future-ready.

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