GENDER DIFFERENCES IN DIGITAL LITERACY AND THEIR PERCEIVED IMPACT ON ENGLISH LANGUAGE SKILLS: A SURVEY OF INDONESIAN EFL STUDENTS

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ABSTRACT

Digital literacy has emerged as a critical competency in modern education, particularly in language education, where technological integration increasingly shapes learning experiences. Despite Indonesia's high internet penetration, the national digital literacy index remains concerningly low, highlighting a significant gap in technological educational readiness. This study aims to investigate digital literacy levels among English language education students, examining gender differences and perceived impacts on language skills through the Technological Pedagogical Content Knowledge (TPACK) framework. Employing a quantitative survey design, the research collected data from 120 undergraduate students at Pattimura University using a validated 28-item questionnaire. Primary findings revealed comparable digital literacy levels between genders (male: 3.06, female: 3.04), with a notable disparity between evaluative and creative digital skills. Students demonstrated high confidence in selecting digital tools (3.07-3.16) but limited ability to explore applications independently (2.42), with the strongest perceived impact on listening skills (3.18) and weakest on reading comprehension (2.88). The study concludes that current digital literacy approaches require strategic interventions to develop more comprehensive technological competencies among pre-service English language educators, ultimately contributing to more effective technology integration in language teaching.

Keywords: *Digital literacy, TPACK framework, Gender differences, English language education, Language skills*

INTRODUCTION

The digital transformation in Indonesia has encouraged technology integration in English language learning, making digital literacy a mandatory competency for English education students. This need has become more urgent as the educational paradigm shifts toward blended learning, accelerated by the COVID-19 pandemic. While 77.01% of Indonesia's population are active Internet users (APJII, 2024), the national digital literacy index only reached 3.54 on a scale

of 5 (Kemenkominfo RI, 2022). This gap potentially hinders the optimization of digital-based language learning.

Digital literacy—the ability to access, evaluate, and use digital information effectively, efficiently, and ethically (Julien, 2018)—can be conceptualized through six interconnected dimensions as identified by Martínez-Bravo et al. (2022): critical, cognitive, operational, social, emotional, and projective. These dimensions align with the Technological Pedagogical Content Knowledge (TPACK) framework proposed by Mishra & Koehler (2006), emphasizing integrating technological knowledge with pedagogical and content knowledge for effective language teaching.

Research on digital literacy in English language education has shown that digital competency positively correlates with language proficiency outcomes (Cao et al., 2023). In Indonesia, Islamia et al. (2024) found that 73% of Indonesian students possess medium levels of digital literacy, with strengths in information searching but weaknesses in understanding socio-cultural contexts. Pertiwi & Rodliyah (2022) discovered that EFL students actively used digital platforms for learning but exhibited limited critical literacy skills. Maharani et al. (2023) found that 78% of English teachers felt ready to use basic technology but struggled with complex tools, with significant differences between male and female teachers in technical literacy skills.

Despite various assessment instruments, these studies lack consistent measurement approaches for meaningful population comparisons. Gender-based digital literacy differences remain underexplored among students despite evidence of gender disparities among teachers. Additionally, the connection between specific digital literacy skills and language competency development has received minimal attention in the Indonesian context.

Based on these identified gaps, this study aims to (1) analyze digital literacy levels of English language education students from a gender perspective, (2) examine digital literacy levels within the TPACK framework, and (3) analyze students' perceptions of digital literacy's impact on their language skills. This research offers significant theoretical and practical contributions to workforce

development, institutional training, and policy guidance to address digital divides in Indonesia's evolving educational landscape.

LITERATURE REVIEW

Conceptualizing Digital Literacy in Language Education

Digital literacy involves navigating, evaluating, and creating information using digital technologies. Martínez-Bravo et al. (2022) identified six interconnected dimensions: critical (assessing information reliability), cognitive (knowledge acquisition skills), operational (functional use of tools), social (interaction in collaborative contexts), emotional (self-regulation), and projective (creativity in digital environments).

The TPACK framework provides a foundation for integrating digital literacy within language instruction by emphasizing the interplay of technological, pedagogical, and content knowledge (Mishra & Koehler, 2006). In language education, TPACK helps teachers design lessons that foster digital literacy while improving language skills through appropriate digital tools (Pangrazio et al., 2020).

Digital technologies serve as mediational tools in language acquisition, offering dynamic channels for content delivery and interaction (Falloon, 2020). However, assessing digital literacy presents challenges, including a lack of standardized tools and measurement frameworks (Reddy et al., 2022).

Gender Differences in Digital Literacy

Gender differences in digital literacy have been extensively documented, with studies revealing notable disparities in digital competencies. Zhou et al. (2023) confirmed that females generally exhibit lower digital competence levels throughout their educational journeys. In the Indonesian context, Maharani et al. (2023) found that male English teachers demonstrated higher levels of digital literacy readiness than their female counterparts.

These patterns are influenced by socio-cultural factors, with traditional gender roles often dictating individuals' interaction with technology and shaping their proficiency and confidence in utilizing digital tools (Aagaard & Madsen,

2022). Gender-responsive approaches to digital literacy development are essential to address these disparities, with Abubakari et al. (2023) advocating for programs in higher education that consider students' specific needs and foster inclusive learning environments.

Digital Literacy's Impact on Language Skills

Studies demonstrate a significant correlation between digital competency and language learning outcomes. Cao et al. (2023) revealed that students with advanced digital skills tend to achieve better results in language learning. This connection manifests across receptive and reading skills (listening and writing) and productive skills (speaking and writing).

Digital platforms with interactive components enhance comprehension by providing diverse contexts and authentic materials such as podcasts and e-books (Hasanah et al., 2022). Similarly, online collaborative tools offer learners opportunities to practice speaking and writing in real time with immediate feedback (Suniyasih et al., 2020).

Student perceptions further illuminate digital literacy's role in language development. Pertiwi & Rodliyah (2022) found that students view technology as valuable for language education, attributing learning successes to digital tools and resources. The digital enhancement of receptive skills occurs through exposure to authentic materials that foster deeper engagement with language nuances. In contrast, productive skills benefit from multimedia resources that allow students to leverage various communication formats.

RESEARCH METHOD

This study employed a quantitative descriptive survey design to investigate the digital literacy levels of English language education students. The research was conducted at the English Education Study Program at Pattimura University in Indonesia. One hundred twenty undergraduate students participated through convenience sampling, consisting of 25 male students (20.8%) and 95 female students (79.2%). The participants were distributed across different years of study:

first year (n=10, 8.3%), second year (n=43, 35.8%), third year (n=37, 30.8%), fourth year (n=16, 13.3%), fifth year (n=10, 8.3%), and sixth year (n=4, 3.3%). Participants' ages ranged from 17 to 24 (M=20.35, SD=1.62). Most participants reported using smartphones for learning (n=108, 90%), while a smaller number used laptops or personal computers (n=12, 10%).

A questionnaire was developed based on the TPACK framework (Mishra & Koehler, 2006) and dimensions of digital literacy (Martínez-Bravo et al., 2022). The questionnaire consisted of two main sections with 28 items in total. The first section assessed digital literacy through the TPACK framework with 12 items divided into three subscales: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), with four items each. The second section measured students' perceptions of digital literacy's impact on language skills with 16 items across four language skill areas: Listening, Speaking, Reading, and Writing Skills Impact, with four items each.

All items were measured on a 4-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree). The instrument underwent expert validation and pilot testing with 15 students. Validity was confirmed using Pearson correlation analysis, and reliability analysis yielded a Cronbach's alpha coefficient of 0.908 for the entire instrument.

Data were analyzed using IBM SPSS version 27 to perform descriptive statistics addressing all three research questions. Mean scores were calculated for male and female students across all TPACK components and language skill areas. The interpretation of mean scores followed these criteria for the 4-point Likert scale, as shown in Table 1.

Table 1. Interpretation Criteria for Mean Scores

Mean Score Range	Category
1.00 - 1.75	Low
1.76 - 2.50	Moderate
2.51 - 3.25	High
3.26 - 4.00	Very High

FINDINGS AND DISCUSSION

Digital Literacy Levels from a Gender Perspective

Analysis of digital literacy levels revealed comparable overall competency between male and female English education students, with both groups demonstrating high proficiency according to the established interpretation criteria. As presented in Table 2, male students exhibited a marginally higher overall mean score (3.06) than female students (3.04), though this difference is statistically negligible.

Table 2. Digital Literacy Levels by Gender

No	Dimension	Male	Category	Female	Category	Overall Mean	Category
1	Technological, Content, and Pedagogical Knowledge	2.93	High	2.96	High	2.95	High
2	Perceived Impact on Language Skills	3.19	High	3.12	High	3.15	High
	Overall	**3.06**	**High**	**3.04**	**High**	**3.05**	**High**

This finding challenges earlier research by Zhou et al. (2023), who found that females generally exhibit lower digital competence levels throughout their educational journeys, and Maharani et al.'s (2023) findings indicate that male English teachers demonstrated higher levels of digital literacy readiness. The parity observed in this study suggests that traditional gender-based digital divides may be narrowing significantly within the specific context of Indonesia's English education programs.

Further examination of specific components revealed nuanced gender-based patterns that conventional binary measurements might overlook. As shown in Table 3, male students reported marginally higher Technological Knowledge (2.90 vs. 2.87), while female students demonstrated higher scores in Pedagogical Knowledge (3.03 vs. 2.96) and Content Knowledge (2.98 vs. 2.93).

Table 3. Digital Literacy Levels within TPACK Framework by Gender

No	Indicators	Male	Interpretation	Female	Category
1	Technological Knowledge (TK)	2.90	High	2.87	High
2	Pedagogical Knowledge (PK)	2.96	High	3.03	High
3	Content Knowledge (CK)	2.93	High	2.98	High
	Overall	**2.93**	**High**	**2.96**	**High**

Similarly, Table 4 illustrates distinct patterns in how male and female students perceive digital literacy's impact on language skills, with male students reporting stronger perceived benefits for receptive skills (listening: 3.25 vs. 3.16; reading: 3.17 vs. 3.04) and female students indicating slightly greater impact on writing skills (3.14 vs. 3.12).

Table 4. Perceived Impact of Digital Literacy on Language Skills by Gender

No	Indicators	Male	Category	Female	Category
1	Impact on Listening Skills	3.25	High	3.16	High
2	Impact on Speaking Skills	3.21	High	3.12	High
3	Impact on Reading Skills	3.17	High	3.04	High
4	Impact on Writing Skills	3.12	High	3.14	High
	Overall	**3.19**	**High**	**3.12**	**High**

These findings align more closely with Abubakari et al.'s (2023) observation that stereotypes linking lower digital skills to females may not apply uniformly across contexts, particularly when appropriate educational support is provided. The results contribute to a more nuanced understanding of gender and digital literacy in language education, suggesting that institutional contexts and educational approaches may effectively mitigate traditionally observed gender disparities. It should be noted, however, that the sample's gender imbalance (25 male, 95 female), while reflective of typical enrollment patterns in language education programs, introduces a methodological limitation regarding statistical power for detecting subtle gender differences.

Digital Literacy Levels within the TPACK Framework

Investigation of digital literacy through the TPACK framework revealed a consistent pattern across all components, with students demonstrating high competency overall (mean 2.95) but with significant variations across specific dimensions. Analysis of the three core TPACK components showed that students expressed the highest confidence in their Pedagogical Knowledge (mean 3.01), moderate confidence in their Content Knowledge (mean 2.97), and lowest confidence in their Technological Knowledge (mean 2.88).

Examination of the Technological Knowledge component (Table 5) revealed a striking disparity between students' adaptive and exploratory competencies. While

students reported high confidence in their ability to adapt to changes in digital tools (mean 3.13) and troubleshoot basic technical problems (mean 3.01), they demonstrated notably lower confidence in exploring new applications independently (mean 2.42), the only "moderate" rating in the entire survey.

Table 5. Technological Knowledge (TK) Items

No	Statement	SD f/%	D f/%	A f/%	SA f/%	Mean	Category
1	I can effectively help others navigate digital platforms used for English language learning.	0 (0.0)	16 (13.3)	93 (77.5)	11 (9.2)	2.96	High
2	I am comfortable exploring new language learning applications without detailed instructions.	13 (10.8)	58 (48.3)	35 (29.2)	14 (11.7)	2.42	Moderate
3	I can quickly adapt to changes in digital tools used for educational purposes.	0 (0.0)	14 (11.7)	77 (64.2)	29 (24.2)	3.13	High
4	I can troubleshoot basic technical problems when using digital resources for my studies.	1 (0.8)	17 (14.2)	82 (68.3)	20 (16.7)	3.01	High
				Overall Mean Score		**2.88**	**High**

Analysis of Pedagogical Knowledge (Table 6) revealed students' greater confidence in evaluative aspects of digital pedagogy compared to creative implementation. The highest mean score (3.16) was recorded for selecting appropriate digital tools for language learning activities, while designing engaging digital learning activities received the lowest score (2.81) in this component, with 35% of students expressing disagreement.

Table 6. Pedagogical Knowledge (PK) Items

No	Statement	SD f/%	D f/%	A f/%	SA f/%	Mean	Category
5	I can select appropriate digital tools to facilitate different types of English language learning activities.	0 (0.0)	11 (9.2)	79 (65.8)	30 (25.0)	3.16	High
6	I can evaluate which digital teaching approaches would be effective in my future English classroom.	0 (0.0)	13 (10.8)	83 (69.2)	24 (20.0)	3.09	High
7	I can design engaging digital learning activities for English language learning.	0 (0.0)	42 (35.0)	59 (49.2)	19 (15.8)	2.81	High
8	I can identify which digital features support different English language learning styles.	0 (0.0)	20 (16.7)	80 (66.7)	20 (16.7)	3.00	High
				Overall Mean Score		**3.01**	**High**

Similarly, Content Knowledge results (Table 6) revealed students' greater comfort with selecting and evaluating existing digital content than with producing original materials. The highest mean score (3.07) was for selecting appropriate digital materials, while creating effective digital content received the lowest score (2.88), with 27.5% of students expressing a lack of confidence.

Table 7. Content Knowledge (CK) Items

No	Statement	SD f/%	D f/%	A f/%	SA f/%	Mean	Category
9	I can evaluate the accuracy of English language information found in online resources.	0 (0.0)	18 (15.0)	86 (71.7)	16 (13.3)	2.98	High
10	I can select digital materials that are appropriate for specific English language learning objectives.	1 (0.8)	13 (10.8)	83 (69.2)	23 (19.2)	3.07	High
11	I can create effective digital content to support English language learning.	1 (0.8)	32 (26.7)	67 (55.8)	20 (16.7)	2.88	High
12	I can reconcile differences between English language information presented across various digital sources.	1 (0.8)	18 (15.0)	86 (71.7)	15 (12.5)	2.96	High
			Overall Mean Score			**2.97**	**High**

This consistent evaluative-creative gap across all TPACK components suggests a fundamental limitation in students' digital literacy development. These findings align with Islamia et al.'s (2024) research, showing that 73% of Indonesian students possess medium levels of digital literacy, with strengths in information searching but weaknesses in creative applications. The pattern suggests that current educational approaches may emphasize the consumption and evaluation of digital content over creation and innovation, a limitation Sriwisathiyakun (2023) addressed through design thinking approaches that yielded significantly higher digital literacy skills.

The TPACK component hierarchy challenges dominant narratives emphasizing technological proficiency as the primary barrier to effective digital integration in education. The findings align with Falloon's (2020) emphasis on the limitations of existing frameworks for digital capability development in teacher education, noting their tendency to focus primarily on technical skills while neglecting broader considerations such as ethical use and digital citizenship. This hierarchy contrasts Liza et al.'s (2020) finding that pre-service English teachers

scored higher in technical skills but demonstrated significant weaknesses in pedagogical applications, highlighting digital literacy development's complex and evolving nature in language education.

Perceived Impact of Digital Literacy on Language Skills

The perceived impact of digital literacy varied substantially across language skill areas, challenging assumptions about where digital tools provide the greatest benefits. Analysis of the four language skill areas revealed that students perceived the strongest impact on listening skills (mean 3.18), followed by equal impacts on speaking and writing skills (mean 3.14), and the lowest impact on reading skills (mean 3.07).

Examination of listening skills (Table 8) revealed the highest overall perceived impact, with one item achieving the only "very high" rating in the entire survey. Students reported that digital audio resources significantly improved their ability to understand various English accents (mean 3.30), with 95% of students agreeing or strongly agreeing. Conversely, comprehending spoken English without textual support received the lowest rating in this category (mean 3.03).

Table 8. Impact on Listening Skills Items

No	Statement	SD f/%	D f/%	A f/%	SA f/%	Mean	Category
13	Digital audio resources have improved my ability to understand various English accents.	0 (0.0)	6 (5.0)	72 (60.0)	42 (35.0)	3.30	Very High
14	Online listening materials have enhanced my comprehension of authentic English conversations.	0 (0.0)	11 (9.2)	76 (63.3)	33 (27.5)	3.18	High
15	Digital tools have helped me develop effective listening strategies for understanding English audio content.	1 (0.8)	6 (5.0)	80 (66.7)	33 (27.5)	3.21	High
16	My ability to comprehend spoken English without textual support has improved through digital resources.	2 (1.7)	17 (14.2)	77 (64.2)	24 (20.0)	3.03	High
				Overall Mean Score		**3.18**	**High**

For speaking skills (Table 9), students reported the highest impact on identifying and improving specific aspects of speaking skills (mean 3.23), with over 95% agreement. However, digital interaction enhancing speaking fluency received

the lowest rating (mean 3.04), with 17.5% disagreement, suggesting potential limitations in how digital tools support spontaneous communication.

Table 9. Impact on Speaking Skills Items

No	Statement	SD f/%	D f/%	A f/%	SA f/%	Mean	Category
17	Digital recording tools have helped me improve my English pronunciation.	1 (0.8)	9 (7.5)	79 (65.8)	31 (25.8)	3.17	High
18	Online speaking practice has increased my confidence in real-life English conversations.	1 (0.8)	17 (14.2)	69 (57.5)	33 (27.5)	3.12	High
19	Digital interaction with other English speakers has enhanced my speaking fluency.	0 (0.0)	21 (17.5)	73 (60.8)	26 (21.7)	3.04	High
20	Technology has helped me identify and improve specific aspects of my English speaking skills.	1 (0.8)	4 (3.3)	82 (68.3)	33 (27.5)	3.23	High
				Overall Mean Score		**3.14**	**High**

Reading skills (Table 10) showed the lowest overall perceived impact despite abundant digital reading materials. While students reported high confidence in digital tools improving strategies for comprehending complex texts (mean 3.18), they expressed notably lower confidence in online resources enhancing overall reading comprehension (mean 2.88), with 24.2% disagreement—the highest disagreement rate for any language skill item.

Table 10. Impact on Reading Skills Items

No	Statement	SD f/%	D f/%	A f/%	SA f/%	Mean	Category
21	Digital reading materials have expanded my English vocabulary beyond what I learn in traditional textbooks.	1 (0.8)	16 (13.3)	68 (56.7)	35 (29.2)	3.14	High
22	Digital tools have improved my strategies for comprehending complex English texts.	0 (0.0)	6 (5.0)	86 (71.7)	28 (23.3)	3.18	High
23	My ability to navigate and understand different types of English texts has improved through digital reading.	0 (0.0)	11 (9.2)	89 (74.2)	20 (16.7)	3.08	High
24	Online reading resources have enhanced my overall English reading comprehension.	0 (0.0)	29 (24.2)	76 (63.3)	15 (12.5)	2.88	High
				Overall Mean Score		**3.07**	**High**

Writing skills (Table 11) demonstrated the most consistent pattern among language competencies, with relatively uniform response distributions across all four items. Students perceived the greatest impact on organization and structure (mean 3.22) and the lowest impact on vocabulary selection (mean 3.09), though all items showed high agreement rates above 90%.

Table 11. Impact on Writing Skills Items

No	Statement	SD f/%	D f/%	A f/%	SA f/%	Mean	Category
25	Digital writing tools have helped me identify and correct patterns in my English writing.	0 (0.0)	11 (9.2)	85 (70.8)	24 (20.0)	3.11	High
26	Online platforms have improved how I organize and structure my English writing.	0 (0.0)	7 (5.8)	80 (66.7)	33 (27.5)	3.22	High
27	Digital feedback has enhanced my ability to select appropriate vocabulary when writing in English.	1 (0.8)	9 (7.5)	88 (73.3)	22 (18.3)	3.09	High
28	My willingness to revise and improve my English writing has increased through digital tools.	1 (0.8)	11 (9.2)	79 (65.8)	29 (24.2)	3.13	High
				Overall Mean Score		**3.14**	**High**

The findings revealed a consistent pattern where students perceived stronger impacts on discrete, identifiable aspects of language performance (e.g., accent recognition, mean 3.30; identifying specific speaking skills, mean 3.23) than on holistic skills (e.g., overall reading comprehension, mean 2.88; speaking fluency, mean 3.04). This suggests that current digital literacy practices may excel at supporting targeted skill development but may be less effective at fostering integrated language competency. This pattern aligns with findings from Alakrash & Razak (2021), who reported that students utilized digital technology most for vocabulary learning (mean 4.05) and least for reading skills (mean 3.60).

The disparity between Cao et al.'s (2023) finding of a strong positive correlation between digital competency and language learning outcomes (path coefficient of 0.84) and the varying perceived impacts across language skills in our study suggests that the relationship between digital literacy and language learning outcomes may be more complex than previously understood. Different digital literacy competencies appear to affect language skills in distinct ways, highlighting

the need for targeted digital literacy development approaches that address the specific needs of each language skill area.

Synthesis and Implications

These findings provide a comprehensive picture of digital literacy among English language education students in Indonesia that both challenges and extends existing understandings. The relative gender parity in overall digital literacy contradicts traditional gender-based digital divides reported in previous studies. The consistent evaluative-creative gap within the TPACK framework highlights a critical limitation in current digital literacy development approaches. The differential perceived impacts across language skills, with the strongest benefits for listening and the weakest for reading, challenge assumptions about where digital tools provide the greatest value in language education.

These findings have significant pedagogical and policy implications for language education in Indonesia. The evaluative-creative gap necessitates a fundamental shift in digital literacy education, moving from consumption-oriented approaches toward creativity-fostering pedagogies that encourage exploration, experimentation, and content creation. Sriwisathiyakun's (2023) success with the design thinking approach provides a promising model for fostering creativity and self-directed learning in digital literacy education.

The subtle gender differences observed suggest the value of gender-responsive digital literacy initiatives that recognize and build upon the different strengths that male and female students bring to digital learning environments, aligning with Sánchez-Canut et al.'s (2023) advocacy for gender-responsive approaches to digital literacy development in higher education. Furthermore, the varying perceived impacts across language skill areas indicate the need for more balanced technology integration approaches targeting reading comprehension and speaking fluency development—areas where students reported relatively lower impacts.

These implications must be considered alongside the study's limitations, including its reliance on self-reported data, cross-sectional design, and focus on a

single educational institution. Nevertheless, the consistent patterns observed across multiple measures provide a solid foundation for future research and educational interventions to enhance digital literacy among English language education students in Indonesia. Addressing these identified gaps as the country advances toward Society 5.0 will be essential for preparing digitally competent English educators who can effectively harness technology to enhance language teaching and learning in an increasingly digital world.

CONCLUSION

This study investigated digital literacy levels among English language education students in Indonesia, examining gender differences, the TPACK framework components, and perceived impacts on language skills. Findings revealed comparable overall digital literacy between genders (male: 3.06, female: 3.04), challenging previous research on pronounced gender-based digital divides while also identifying a significant evaluative-creative gap across all TPACK components, with students demonstrating high confidence in selecting digital tools (means 3.07-3.16) but notably lower confidence in independent exploration (2.42) and content creation (2.81-2.88). Students perceived the strongest digital literacy impacts on listening skills (3.18), particularly for understanding various English accents (3.30), and the weakest impacts on reading comprehension (2.88), suggesting that current digital practices excel at supporting discrete language skills rather than integrated competencies. These findings contribute empirical evidence for curriculum enhancement in teacher education programs, highlighting the need for educational interventions targeting creative digital skills development, gender-responsive approaches, and balanced technology integration across all language domains to prepare digitally competent English educators for Indonesia's transition to Society 5.0.

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