



MAPPING THE DIGITAL LITERACY OF EFL STUDENTS IN A RURAL HIGHER EDUCATION CONTEXT: A FOUR-DIMENSIONAL APPROACH

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Abstract

This study intends to delineate the digital literacy of EFL students in a rural higher education context through a four-dimensional framework: digital skills, digital safety, digital ethics, and digital culture. A quantitative descriptive design was utilized to gather data from 79 undergraduate students via a structured questionnaire. The finding indicates that although students exhibit robust fundamental digital skills, especially in tool utilization and online safety awareness, they encounter difficulties in content production, academic integrity, and active participation in digital communities. The findings underscore the disparate allocation of digital literacy influenced by infrastructural and contextual constraints. The research finds that digital literacy in rural English as a Foreign Language should be recognized as a socially contextualized and culturally influenced phenomenon. The implications include a necessity for customized teaching tactics, curricular incorporation, and institutional assistance to tackle digital inequalities and foster fair access to 21st-century skills in underfunded educational environments.

Keywords: Digital literacy, EFL students, rural higher education, four-dimensional framework, digital competence mapping

INTRODUCTION

Integrating digital technologies into education has revolutionized the learning environment at all levels, encompassing higher education. In the 21st Century, digital literacy is vital for traversing academic, social, and professional spheres (Alenezi, 2023; Tinmaz et al., 2022). For English as a Foreign Language (EFL) students, digital literacy is particularly significant as it enhances language acquisition, fosters intercultural conversation, encourages autonomous study, and provides access to a broader spectrum of knowledge (Markevica & Dzerviniks, 2022; Young, 2017). As a result, higher education institutions worldwide are progressively anticipated to cultivate students' digital literacy in conjunction with conventional academic competencies. Digital literacy is a complex and contextually dependent concept. It includes not only technical expertise in using digital technologies but also the ethical, cultural, and safety aspects of participating in digital settings (Buchholz et al., 2020; Chiu et al., 2024; González et al., 2021). Digital literacy must go beyond mere operational abilities, emphasizing a sophisticated integration of cognitive, socio-cultural, and affective dimensions (Belshaw, 2011; Alkalai, 2004). This multifaceted viewpoint is especially pertinent in EFL environments since learners frequently utilize digital media for language acquisition and communication, academic collaboration, and identity development in virtual contexts.

Despite the growing importance of digital literacy, discrepancies in its advancement are still apparent, particularly among students in rural higher education institutions (Onwe & Ezekwe, 2014; Zou et al., 2025). Urban universities typically possess superior infrastructure, enhanced training opportunities, and increased exposure to digital tools. In contrast, students in rural regions often encounter challenges such as inadequate internet connectivity, insufficient institutional support, and a deficiency in the pedagogical integration of digital literacy within curriculum design (Hecker & Loprest, 2019; Sundeen & Sundeen, 2013; Torabi et al., 2023). These issues are especially pronounced for EFL students, who must interact with digital texts and platforms in a second or foreign language, potentially complicating their digital learning experiences (Chan & Lo, 2024; Guo et al., 2025).

In Indonesia, characterized by geographical and infrastructural differences, the advancement of digital literacy among rural students is a significant educational issue (Amin, 2018; Onitsuka et al., 2018). Diverse governmental policies, including the "Merdeka Belajar" (Freedom to Learn) project, advocate for digital learning and the incorporation of ICT in higher education (Arkiang & Adwiah, 2021; Onitsuka et al., 2018). Nonetheless, these policies frequently assume a degree of digital preparedness that may not be consistently available in all circumstances. In rural places, the presumption of digital nativeness among young individuals may conceal significant shortcomings in fundamental digital skills and abilities (Flynn, 2021; Salemink et al., 2015; Torabi et al., 2023). EFL students in these environments may encounter difficulties with the technical utilization of digital technologies and comprehending online safety protocols, navigating digital ethics, and participating in digital cultures meaningfully and thoughtfully.

While many studies have investigated digital literacy among university students, the current literature predominantly emphasizes urban or technologically advanced environments (Abrosimova, 2020; Ángel et al., 2022; Murray & Pérez, 2014), frequently neglecting the distinct challenges and opportunities found in rural educational settings. Furthermore, studies on digital literacy among EFL students often prioritize either technological or pedagogical elements, neglecting to adequately consider the broader cultural and ethical implications (Pangrazio et al., 2020; Pratolo & Solikhati, 2020; Soifah et al., 2021; Zhang, 2023). Limited empirical research has utilized a comprehensive paradigm encompassing digital literacy's intricacies in multilingual, multicultural, and resource-limited contexts. Even fewer studies have comprehensively analyzed the distinct experiences of EFL learners in rural Indonesian universities, whose requirements and settings significantly diverge from those of their urban counterparts (Joubert et al., 2023; Rini et al., 2020). Furthermore, the majority of research on digital literacy in EFL classrooms predominantly emphasizes the efficacy of digital media in enhancing student learning outcomes, utilizing generalized or decontextualized assessment tools that neglect the socio-cultural and linguistic factors intrinsic to EFL education (Al-Seghayer, 2020; Ghouali & Benmoussat, 2019; Ikaningrum & Sarwanti, 2021; Soifah et al., 2021; Valentina et al., 2022). The intricate methods by which rural EFL students understand, implement, and navigate digital literacy have yet to be examined.

This study addresses these gaps by providing a context-specific and multidimensional analysis of digital literacy among EFL students at a rural higher education institution in Indonesia. It utilizes a four-dimensional framework—encompassing digital skills, digital safety, digital ethics, and digital culture—to offer a

thorough overview of students' digital literacy practices. This study's originality stems from synthesizing theoretical perspectives from digital literacy, language education, and rural pedagogy to provide a comprehensive analytical framework. This study aims to assess the digital literacy of EFL students at a rural Indonesian university through a four-dimensional analytical framework. It examines learner engagement with digital technologies across four principal dimensions: (1) digital skills, (2) digital safety, (3) digital ethics, and (4) digital culture.

METHOD

This research adopted a quantitative descriptive approach to examine the digital literacy of EFL students in a rural higher education institution in Indonesia. A quantitative approach was selected to rigorously evaluate and delineate the students' competencies across four principal dimensions of digital literacy: digital skills, digital safety, digital ethics, and digital culture. Descriptive research designs aid researchers in identifying trends or characteristics of a group using numerical data and statistical analysis (Creswell, 2014). Descriptive research aims to systematically outline a situation, issue, event, service, or comparable entity (Gay, Mills, & Airasian, 2012).

The research was carried out at Khairun University Ternate, Indonesia. This institution was chosen for its rural setting and its function in facilitating higher education access for students from under-represented and geographically distant communities. The rural environment offers a distinctive viewpoint on the evolution of digital literacy, frequently influenced by inadequate technology infrastructure and access inequalities. The study subjects comprised undergraduate students in English language instruction from various semesters. A total of 79 students were selected by a purposive sample appropriate for identifying specific populations with pertinent characteristics—in this instance, EFL students actively participating in higher education in a rural context. This sampling method guaranteed the participation of individuals with diverse experiences and varying degrees of exposure to digital tools in both their academic and personal contexts.

A structured questionnaire was the principal tool employed for data collection to assess students' self-perceived competencies and behaviors concerning digital literacy. The questionnaire was designed following a comprehensive analysis of the digital literacy literature and adapted to the EFL classroom environment. It consisted of four principal portions, each aligned with one of the four pillars of digital literacy: (1) Digital Skills: seven indicators measuring functional and technical proficiency in utilizing digital tools for learning; (2) Digital Safety: six indicators related to awareness and practices regarding online privacy, security, and data protection; (3) Digital Ethics: six indicators addressing responsible, respectful, and lawful engagement in digital environments; and (4) Digital Culture: six indicators assessing cultural adaptability, online collaboration, and participation in digital communities. Each item employed a five-point Likert scale, with 1 representing Strongly Disagree and five representing Strongly Agree. The questionnaire underwent validation via expert assessment and was piloted with a select group of students to ensure clarity, dependability, and cultural relevance.

Data were gathered over two weeks via self-administered and provided in digital formats (Google Forms) to suit students' diverse access to technology. Participation was optional, and informed consent was acquired prior to data collection. Subjects were guaranteed the secrecy and anonymity of their responses. The data-gathering process

maintained stringent ethical criteria to assure the legitimacy of the findings, encompassing transparency of purpose, the right to withdraw, and the protection of personally identifiable information. The quantitative data obtained from the questionnaire were examined with descriptive statistical techniques. The analysis was performed in the subsequent stages: Descriptive Statistics: mean scores, standard deviations, frequency distributions, and percentages were computed for each item and dimension to elucidate the students' digital literacy profiles.

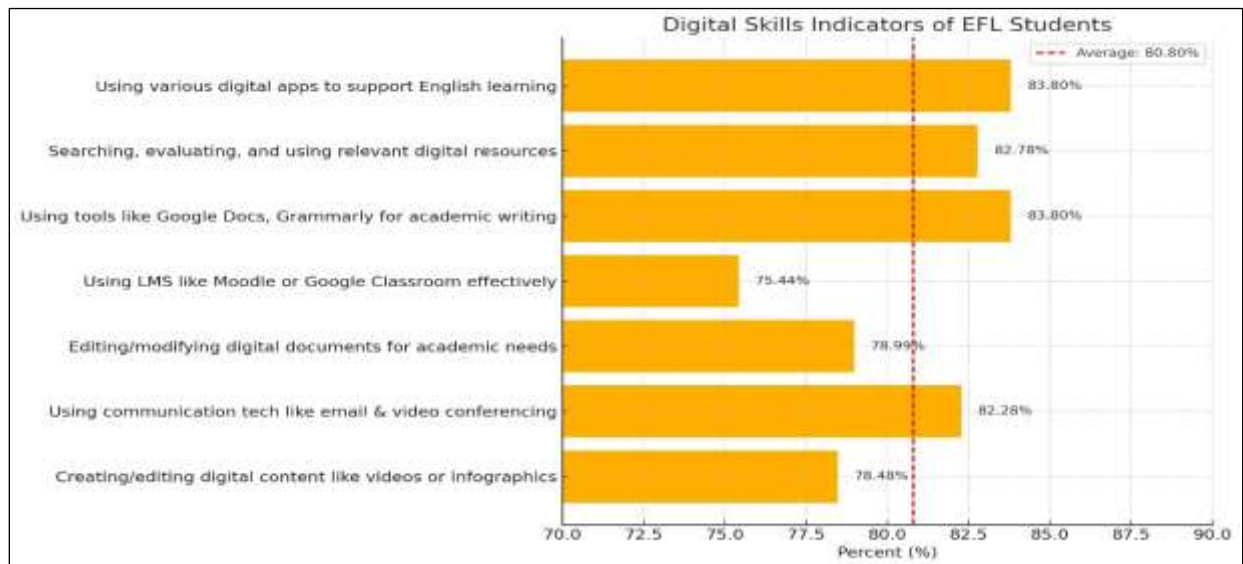
RESULTS AND DISCUSSION

Results

The research findings on the four dimensions of digital literacy, which were analyzed using descriptive statistics, are systematically and comprehensively presented in the tables and figures below.

Table 1. Statistic Descriptive analysis of EFL Students' digital skills	
Digital Skills	
Statistical Components	Results
Mean	28,28
Standard Error	0,50
Median	29,00
Mode	32,00
Standard Deviation	4,48
Total sample	79,00

The descriptive statistical analysis of EFL students' digital skills in Table 1 provides substantial insights into their general proficiency in digital competence. The average score of 28.28, obtained from a sample of 79 students, signifies a moderate degree of digital proficiency within the investigated group. The median score of 29.00, somewhat above the mean, indicates a slight negative skew in the data distribution. The median score of 32.00 reinforces this skewness, indicating that many students exhibited above-average digital skills. The standard deviation of 4.48 indicates a substantial dispersion from the mean, implying variety in students' digital competencies, potentially due to varying access to technology, past exposure, or educational backgrounds. The modest standard error (0.50) indicates that the sample mean is a dependable estimate of the population mean, enhancing confidence in the generalizability of the results. While central tendency tests indicate overall digital competency, the variability highlights the necessity of addressing gaps through targeted support or tailored training. This analysis offers a robust empirical basis for pedagogical interventions to improve equitable digital literacy development among EFL students, particularly in rural or resource-constrained environments.

Percentage of EFL Student's Digital Skills**Figure 1.** The frequency distribution of EFL Students Digital Skill

The bar chart data provides a detailed overview of EFL students' digital competencies across seven essential indicators. The highest skill levels are demonstrated in "Utilizing various digital applications to facilitate English learning" and "Employing tools such as Google Docs and Grammarly for academic writing," exhibiting a significant presence rate of 83.80%. This indicates that students possess considerable confidence in utilizing practical digital applications to improve language acquisition and academic writing, demonstrating their adaptability to tools that directly help their academic success. A notable proficiency is evident in "Searching, evaluating, and using relevant digital resources" (82.78%) and "Using communication technologies like email and video conferencing" (82.28%), demonstrating that students possess both independent information literacy and digital communication skills, which are crucial for academic collaboration and remote learning.

In contrast, diminished performance is shown in "Effectively utilizing LMS such as Moodle or Google Classroom" (75.44%) and "Creating/editing digital content such as videos or infographics" (78.48%). The data indicates difficulties maneuvering through organized digital learning platforms and content generation, highlighting deficiencies in advanced or innovative digital literacy. The average score of 80.80% indicates general proficiency; nonetheless, the variances among indicators underscore the necessity for specialized training, especially in learning management systems and multimedia content creation, to guarantee comprehensive digital literacy among EFL students.

Table 2. Statistic descriptive analysis of EFL students' Digital Ethics

Digital Ethics	
Statistical Components	Results
Mean	25,90
Standard Error	0,41
Median	26,00

Mode	30,00
Standard Deviation	3,64
Total sample	79

The findings for EFL students' digital ethics, as presented in the table, indicate a predominantly favorable disposition towards ethical digital conduct. The average score of 25.90 indicates that students exhibit a reasonably strong understanding and application of digital ethics. However, there is still potential for enhancement. The median score of 26.00, which nearly aligns with the mean, signifies a symmetrical distribution, affirming the central tendency's reliability. The mode of 30.00, significantly above the mean, indicates that a sizeable percentage of students demonstrate elevated ethical standards in their digital actions, perhaps distorting the distribution slightly towards the higher end. The standard deviation 3.64 signifies moderate diversity in students' digital ethics scores, indicating disparities in individual comprehension or dedication to ethical digital conduct.

The comparatively low standard error (0.41) indicates that the mean accurately represents the population's ethical attitude. The data, derived from a substantial sample size of 79 people, is deemed statistically and contextually credible. In conclusion, although the average ethical awareness among EFL students is encouraging, the observed variation indicates that organized educational initiatives must strengthen uniform and thorough digital ethics, particularly in progressively digital academic and social contexts.

Percentage of EFL Students' Digital Ethics

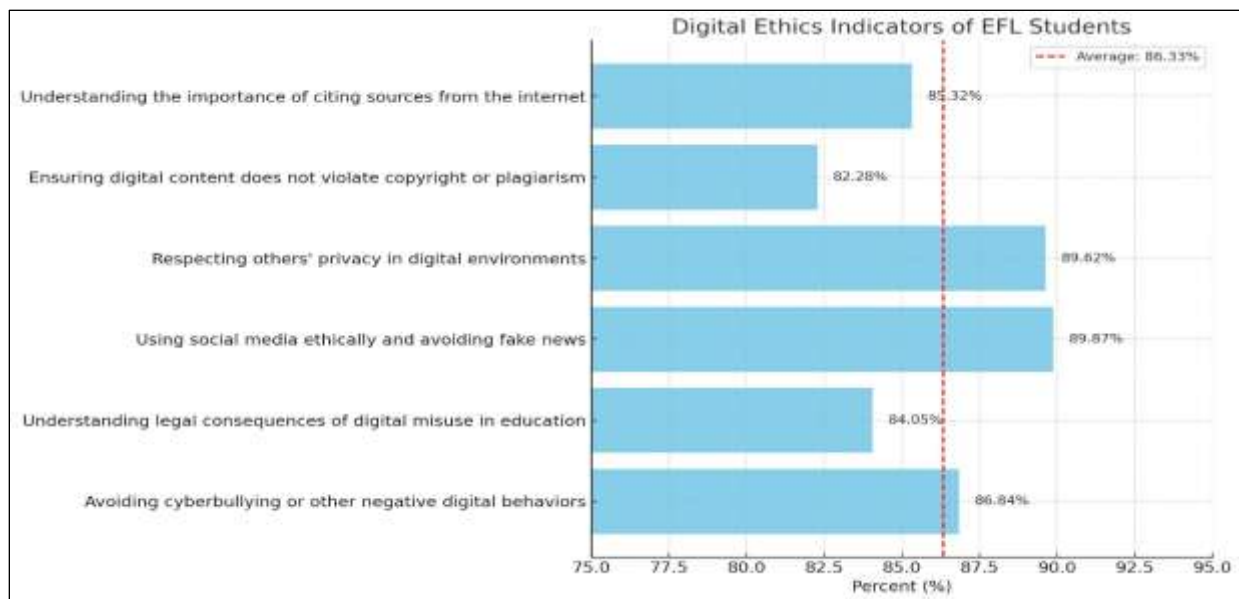


Figure 2. The frequency distribution of EFL Students Digital Ethics

The chart illustrates the distribution of EFL students' digital ethics across six principal metrics, demonstrating a robust awareness with an average of 86.33%. The highest score, 89.87%, is recorded in “Using social media ethically and avoiding fake news,” suggesting that students possess a critical awareness of the dangers of disinformation and are likely engaging in responsible online conduct. The subsequent point is “Respecting others’ privacy in digital environments” (89.62%), indicating a strong commitment to

ethical interpersonal behavior in digital contexts—an indispensable quality in a progressively interconnected academic landscape. Students demonstrate notable proficiency in “Avoiding cyberbullying or other negative digital behaviors” (86.84%) and “Understanding legal consequences of digital misuse in education” (84.05%), indicating a high degree of ethical sensitivity and legal understanding.

Nevertheless, two indicators are marginally below the average: “Comprehending the significance of citing online sources” (85.32%) and “Ensuring digital content adheres to copyright and plagiarism regulations” (82.28%). These scores, albeit still comparatively elevated, indicate a necessity for enhanced focus on academic integrity and intellectual property rights. In summary, although EFL students exhibit a robust awareness of digital ethics, especially regarding social conduct, it is urgent to enhance their comprehension of ethical academic practices via focused education and institutional support.

Table 3. Statistic descriptive analysis of EFL students' digital safety

Digital Safety	
Statistical Components	Results
Mean	26,09
Standard Error	0,43
Median	27,00
Mode	30,00
Standard Deviation	3,82
Total sample	79

The findings of EFL students' digital safety reveal a generally strong awareness, with a mean score of 26.09 out of a possible higher value (presumably 30), indicating a positive overall understanding of safe digital practices. The median score of 27.00, slightly above the mean, suggests that more than half of the students scored on the higher end of the scale, reflecting a tendency toward cautious and responsible digital behaviour. The mode of 30.00, representing the most frequently occurring score, further emphasizes that a notable portion of students exhibit excellent digital safety practices. The standard deviation of 3.82 indicates moderate variability in students' digital safety awareness, suggesting a range of understanding across the sample. A standard error of 0.43 denotes a relatively precise estimate of the population mean, supported by a sufficient sample size of 79 participants, enhancing the findings' reliability.

Collectively, the data imply that while most EFL students possess solid digital safety knowledge, a subset remains who may be less informed or cautious. This justifies the need for targeted educational efforts to ensure consistent competencies in areas such as password security, data privacy, and protection from online threats across the entire student population.

Percentage of EFL Students' digital safety



Figure 3. The frequency distribution of EFL students' digital safety

The graphic data illustrates EFL students' digital safety awareness across six critical indicators, with an average competency rate of 86.96%. Notably, the highest score (91.65%) is attributed to "Being cautious when sharing personal information online," indicating high student vigilance regarding data exposure in digital spaces. This strong performance reflects an encouraging sensitivity to personal privacy, likely influenced by increasing global awareness of cyber threats. Equally strong are the indicators "Understanding the importance of protecting personal data" (89.11%) and "Using strong and unique passwords for digital accounts" (88.35%), demonstrating that students are generally well-informed about safeguarding their digital identities and preventing unauthorized access. However, "Verifying the authenticity of information sources" (85.32%) and "Being aware of digital threats like phishing, malware, and viruses" (85.32%) reveal slightly lower but still solid awareness levels. These findings suggest that while students recognize the existence of digital threats, deeper instruction in critically assessing online content and detecting sophisticated cyber-attacks may be beneficial.

The lowest score is seen in "Regularly updating software and apps for security" (82.03%), pointing to a common oversight among users regarding system maintenance and its role in digital safety. Overall, the data reflects commendable digital safety awareness yet highlights areas where practical reinforcement and continuous education are needed to foster a more holistic security culture.

Table 4. Statistic descriptive analysis of EFL students' digital culture

Digital Culture	
Statistical Components	Results
Mean	24,61
Standard Error	0,45
Median	25,00

Mode	24,00
Standard Deviation	3,97
Total Sample	79

The statistical findings for EFL students' digital culture indicate moderate cultural participation and proficiency in digital contexts. The mean score of 24.61 signifies that, on average, students exhibit a moderate comprehension of digital culture; nonetheless, this score is comparatively lower than in other digital literacy categories, indicating a possible area for improvement. The median score of 25.00 roughly corresponds with the mean, suggesting a relatively symmetrical distribution of responses.

The mode of 24.00, somewhat below the mean, indicates that many students score within the lower-middle range, implying restricted exposure or participation with varied digital cultural practices. The standard deviation of 3.97 indicates a moderate variety in students' awareness and behaviors, suggesting that while some students are knowledgeable about digital cultural norms, others may lack essential comprehension or engagement. The standard error of 0.45 and a sample size of 79 guarantees statistical dependability and precision in reflecting the larger population.

The findings indicate that while students exhibit fundamental proficiency in digital culture, more organized opportunities to engage in digital citizenship, intercultural communication, online collaboration, and ethical involvement in digital communities are necessary. Improving these areas would cultivate a more inclusive, respectful, and internationally conscious internet presence among EFL students.

Percentage of EFL Students' Digital Culture

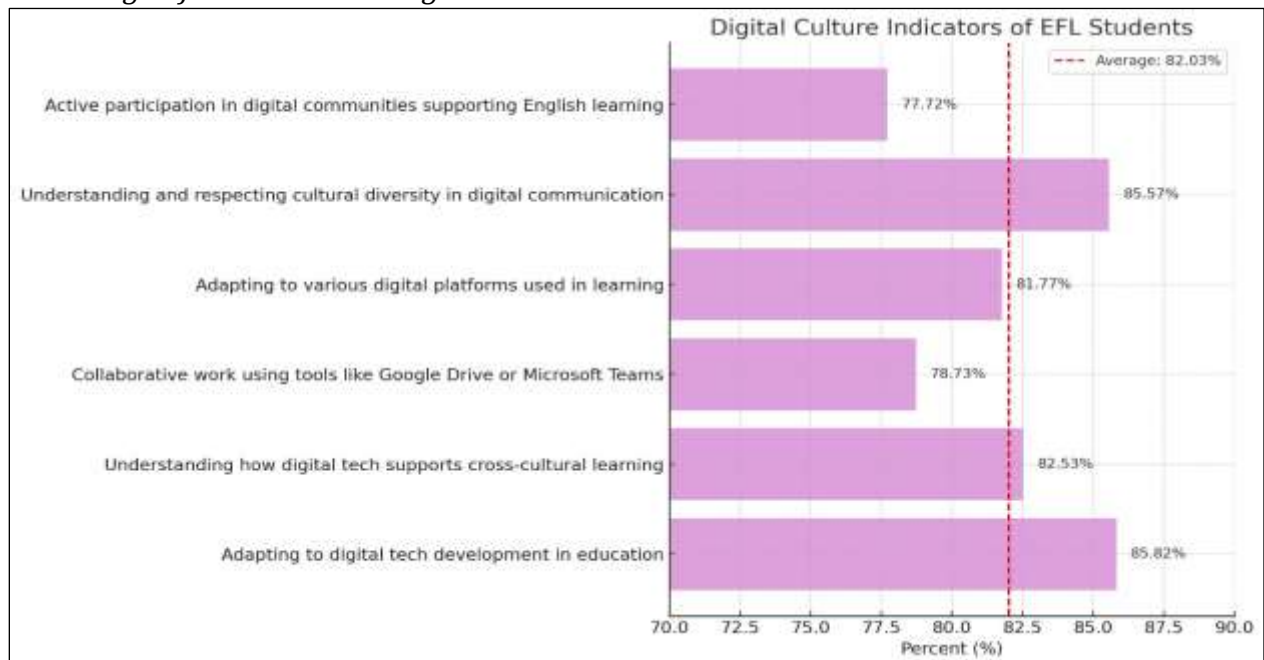


Figure 4. The frequency distribution of EFL students' Digital Culture

The graphic illustrates the distribution of EFL students' digital culture awareness over six principal metrics, with an overall average of 82.03%. The crucial metric, “Adapting

to digital tech development in education” (85.82%), signifies students’ robust response to developing technologies inside learning environments, indicating their receptiveness to change and ability to acclimatize to digital improvements. The subsequent point is “Understanding and respecting cultural diversity in digital communication” (85.57%), signifying a substantial degree of intercultural sensitivity—an indispensable element of global digital citizenship.

Similarly, “Comprehending how digital technology facilitates cross-cultural learning” (82.53%) and “Adjusting to diverse digital platforms utilized in education” (81.77%) indicate that students exhibit an understanding of the wider educational and cultural roles of digital tools. Nonetheless, diminished outcomes in “Collaborative work utilizing platforms such as Google Drive or Microsoft Teams” (78.73%) and particularly “Active participation in digital communities that facilitate English learning” (77.72%) indicate difficulties in digital collaboration and engagement. These findings indicate that although students are predominantly digitally adept and culturally conscious, their engagement in interactive digital learning environments and collaborative settings is still restricted. Strategic initiatives to enhance active digital community participation and collaboration may improve digital cultural competence and encourage more participatory, cooperative, and inclusive learning methodologies.

Discussion

The results demonstrate a moderate to high competency in fundamental digital abilities among rural EFL students, especially in utilizing programs for academic writing and communication (e.g., Google Docs, Grammarly, email, and video conferencing). These results align with prior studies that found university students generally possess foundational digital competencies (Ng, 2012; Siddiq et al., 2016). This finding introduces complexity by emphasizing deficiencies such as learning management system (LMS) navigation and digital content creation—competencies frequently assumed in urban-centric studies (Hatlevik & Christophersen, 2013). Although prior research (Rahimi & Yadollahi, 2017) highlights the educational potential of digital tools, it frequently neglects rural inequities in infrastructure and training, which the study addresses. Furthermore, the study distinguishes itself from typical digital literacy assessments by situating skill application within EFL tasks, demonstrating the interconnection of linguistic and digital proficiencies. The focus on rural contexts and English-specific digital applications significantly contributes to the area, highlighting the complex nature of digital competency influenced by geographic and disciplinary factors.

Simultaneously, research indicates a significant ethical awareness among students, especially around social media usage, attitudes towards anti-cyberbullying, and respect for privacy. These findings correspond with recent trends highlighting the increasing moral awareness of digital users (Tondeur et al., 2022). The subpar performance in academic integrity, such as the citation of online sources, aligns with the findings of Aviram et al. (2016), who observed that ethical deficiencies continue to exist in higher education, particularly with plagiarism. This research is distinguished by its rural EFL perspective, which demonstrates that. In contrast, ethical standards in interpersonal digital conduct are generally elevated, and the internalization of academic digital ethics is inconsistent—probably attributable to insufficient formal education in digital academic norms. It contextualizes ethical behavior at the intersections of language hurdles, digital

unfamiliarity, and restricted access to academic training materials, in contrast to prior studies that concentrated on urban or globalized student populations (Alzaghal et al., 2018). This introduces complexity to our comprehension of digital ethics in multilingual and under-resourced contexts, contesting the idea of ethics as a homogeneous digital competency.

Furthermore, findings related to digital safety indicate that EFL students exhibit considerable digital safety awareness, particularly regarding personal data security. This corroborates trends in contemporary literature, indicating that students are becoming progressively more attentive to privacy (Martínez-Cerdá et al., 2020). The diminished proficiency in software updating results aligns with the conclusions of Livingstone et al. (2017), who contended that safety awareness is frequently disjointed and procedural. In contrast to several urban-focused studies (van Deursen & van Dijk, 2014), the present research elucidates how digital safety is influenced by inadequate institutional training and intermittent engagement with cyber security material. The study's rural context is essential—it broadens the discussion by demonstrating how adolescents acquire informal safety practices through experiential learning rather than formal instruction. This contextualization contests the presumption of universal digital proficiency among students (Prensky, 2012) and advocates for a tailored digital safety curriculum. The innovation involves elucidating the comprehension and implementation of digital safety in under-resourced, EFL-specific contexts, where language proficiency and internet accessibility influence online safe conduct.

In digital culture, the results indicate a moderate involvement, characterized by strengths in technological adaption and intercultural communication and deficiencies in digital cooperation and community engagement. Although previous studies have highlighted the significance of cultural awareness and participatory digital citizenship (Belshaw, 2011; Jenkins et al., 2016), this research reveals a disconnect between awareness and action—students comprehend digital cultural norms yet never participate profoundly in online groups. This discovery contrasts with urban-focused literature that presumes widespread online engagement among adolescents (Greenhow & Lewin, 2016). The study offers a crucial rural EFL viewpoint, indicating that restricted access, unfamiliarity with digital platforms, and linguistic insecurity may impede active involvement in digital culture. This facet is frequently overlooked in conventional digital literacy research, which commonly standardizes learner experiences. Current research contribution uniquely highlights that digital culture in rural EFL contexts involves adhering to global standards and negotiating identity, engagement, and visibility within limited digital environments.

Here is the mapping of students' digital literacy overall, as depicted in the following figure:

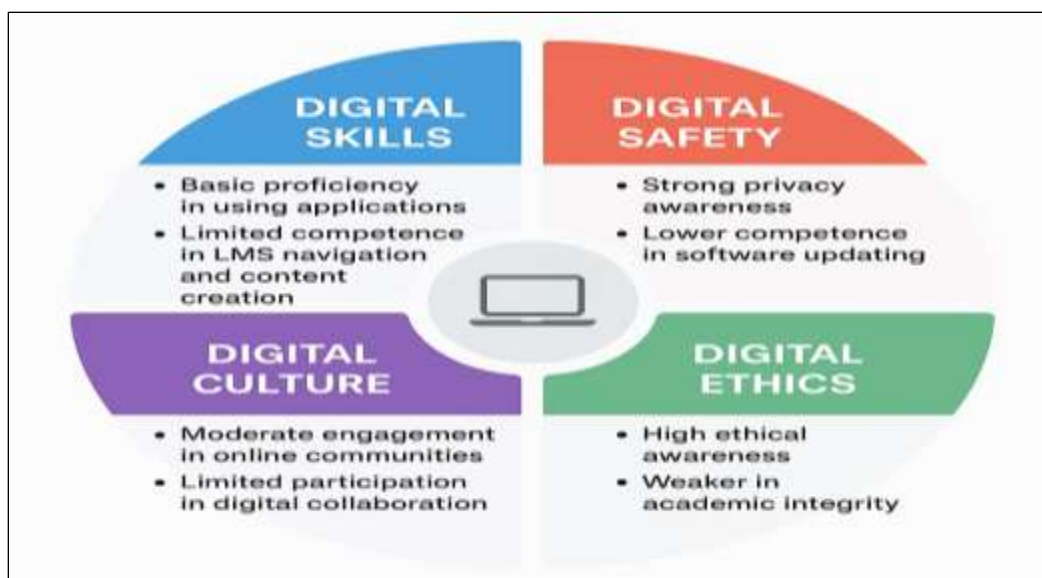


Figure 5. Mapping the Digital Literacy of EFL Students in a Rural Higher Education Context

This graphic presents a visual synthesis of the four-dimensional framework employed to assess the digital literacy of EFL students in rural higher education. In blue, Digital Skills encompass students' essential competencies in employing digital resources for educational objectives. The picture highlights that although students demonstrate competence in utilizing fundamental programs (e.g., Google Docs, Grammarly), they exhibit a notable deficiency in navigating Learning Management Systems (LMS) and participating in creative content creation. This indicates a fragmented yet inconsistent interaction with instructional tools.

Digital Ethics, in green, represents students' ethical perspective in digital contexts. The graphic highlights a strong ethical awareness in social behaviors, including respect for privacy and the avoidance of cyberbullying, while indicating a deficiency in academic integrity, especially with citation and copyright standards. In red, Digital Safety represents students' cognizance of secure digital habits. The picture demonstrates a robust comprehension of personal data protection while indicating shortcomings in technical maintenance activities, including software updates. This discrepancy indicates that safety awareness exists, although operational depth is insufficiently developed. Digital Culture, denoted in purple, reflects students' ability to engage substantively in digital communities. Although there is moderate involvement in adjusting to technology and multicultural aspects, participation in collaborative digital settings, such as online forums or peer-learning networks, remains restricted. This emphasizes the necessity of promoting digital citizenship and collaborative learning methodologies. The graphic functions as a summary and diagnostic instrument, allowing educators and policymakers to discern strengths and deficiencies in students' digital literacy. The quadrant framework visually underscores the interrelation of these competencies, highlighting that comprehensive digital literacy must encompass technical, ethical, safety, and cultural aspects—particularly in resource-limited rural EFL environments.

CONCLUSION

This research evaluated the digital literacy of EFL students in a rural higher education setting through a four-dimensional framework: digital skills, digital safety, digital ethics, and digital culture. The findings indicate that although students demonstrate robust foundational skills—especially in application usage, privacy awareness, and ethical online conduct—significant deficiencies exist in more intricate domains such as learning management system navigation, academic integrity, software maintenance, and engagement in digital communities. The results indicate that digital literacy among rural EFL students is inconsistently distributed and significantly influenced by contextual constraints, including infrastructural deficiencies, language obstacles, and inadequate pedagogical assistance.

This research has multiple ramifications. Educators must develop focused treatments beyond fundamental digital instruction to encompass ethical reasoning, collaborative involvement, and critical digital participation. Institutions should incorporate extensive digital literacy modules into EFL courses, prioritizing context-specific education and equitable access. Policymakers must reevaluate digital activeness assumptions and prioritize resource distribution, teacher training, and infrastructure development in remote areas. This study introduces a unique rural EFL perspective to the broader discussion on digital literacy, emphasizing the necessity of socially contextualized and linguistically adaptive frameworks for fair digital education.

ACKNOWLEDGMENT

I want to sincerely thank the Government of the Republic of Indonesia, through Lembaga Pengelola Dana Pendidikan (LPDP), for financing my doctoral studies and facilitating the publication of this article. I employed artificial intelligence (ChatGPT) to assist in the design of figures 1 to 5.

REFERENCES

- Abrosimova, G. (2020). Digital Literacy and Digital Skills in University Study. *International Journal of Higher Education*, 9(8), 52. <https://doi.org/10.5430/ijhe.v9n8p52>
- Alenezi, M. (2023). Digital Learning and Digital Institution in Higher Education. *Education Sciences*, 13(1), 88. <https://doi.org/10.3390/educsci13010088>
- Alkalai, E. Y. (2004). Digital Literacy: A Conceptual Framework for Survival Skills in the Digital Era. *Journal of Educational Multimedia and Hypermedia*, 13(1).
- Al-Seghayer, K. (2020). Investigating the Adequacy of EFL Learners' L2 Digital Literacy Skills, Consistency of Self-Assessed Competence, and Actual Performance. *International Journal of Computer-Assisted Language Learning and Teaching*, 10(2), 1. <https://doi.org/10.4018/ijcallt.2020040101>
- Alzaghal, M., Al-Adwan, A. S., & Al-Adwan, A. (2018). Investigating ethical behavior in online learning environments among higher education students. *Education and Information Technologies*, 23(2), 679–695. <https://doi.org/10.1007/s10639-017-9629-2>
- Amin, M. (2018). ICT for Rural Area Development in Indonesia: A Literature Review. *Journal of Information Technology and Its Utilization*, 1(2), 32. <https://doi.org/10.30818/jitu.1.2.188>

- Ángel, N. G., Sánchez, J. N. G., Rubio, I. M., García-Martín, J., & Brito-Costa, S. (2022). Digital literacy in the university setting: A literature review of empirical studies between 2010 and 2021 [Review of Digital literacy in the university setting: A literature review of empirical studies between 2010 and 2021]. *Frontiers in Psychology*, 13. Frontiers Media. <https://doi.org/10.3389/fpsyg.2022.896800>
- Arkiang, F., & Adwiah, R. (2021). Photos of Learning during Pandemic Covid-19 on Frontier, Outermost, and Disadvantaged Areas East Nusa Tenggara. *Edukasi*, 15(1), 29. <https://doi.org/10.15294/edukasi.v15i1.30048>
- Aviram, A., Ronen, Y., Somekh, S., Winer, A., & Sarid, A. (2016). Teachers' ethical behavior as a learning environment factor in higher education. *Learning Environments Research*, 19(3), 487–500. <https://doi.org/10.1007/s10984-016-9210-1>
- Belshaw, D. A. J. (2011). *The essential elements of digital literacies* (Doctoral dissertation, Durham University). Retrieved from <http://etheses.dur.ac.uk/3446>
- Buchholz, B. A., DeHart, J. D., & Moorman, G. B. (2020). Digital Citizenship during a Global Pandemic: Moving Beyond Digital Literacy. *Journal of Adolescent & Adult Literacy*, 64(1), 11. <https://doi.org/10.1002/jaal.1076>
- Chan, S., & Lo, N. (2024). Enhancing EFL/ESL instruction through gamification: a comprehensive review of empirical evidence [Review of Enhancing EFL/ESL instruction through gamification: a comprehensive review of empirical evidence]. *Frontiers in Education*, 9. Frontiers Media. <https://doi.org/10.3389/feduc.2024.1395155>
- Chiu, T. K. F., Ahmad, Z., Ismailov, M., & Sanusi, I. T. (2024). What are artificial intelligence literacy and competency? A comprehensive framework to support them. *Computers and Education Open*, 6, 100171. <https://doi.org/10.1016/j.caeo.2024.100171>
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.
- Flynn, S. (2021). Education, Digital Natives, and Inequality. *Irish Journal of Sociology*, 29(2), 248. <https://doi.org/10.1177/07916035211004815>
- Gay, L. R., Mills, G. E., & Airasian, P. W. (2012). *Educational research: Competencies for analysis and applications* (10th ed.). Pearson Education.
- Ghouali, K., & Benmoussat, S. (2019). Investigating the Effect of Social Media on EFL Students' Written Production: Case of Third-Year EFL Students at Tlemcen University, Algeria. *Arab World English Journal*, 1, 24. <https://doi.org/10.24093/awej/chief1.3>
- González, M. C., Martín, S. C., & Muñoz-Repiso, A. G. (2021). Basic Education Students' Digital Competence in Communication: The Influence of Online Communication and Social Networks. *Sustainability*, 13(8), 4442. <https://doi.org/10.3390/su13084442>
- Greenhow, C., & Lewin, C. (2016). Social media and education: Reconceptualizing the boundaries of formal and informal learning. *Learning, Media and Technology*, 41(1), 6–30. <https://doi.org/10.1080/17439884.2015.1064954>
- Guo, S., Halim, H. B. A., & Saad, M. R. B. M. (2025). Leveraging AI-enabled mobile learning platforms to enhance the effectiveness of English teaching in universities. *Scientific Reports*, 15(1). <https://doi.org/10.1038/s41598-025-00801-0>
- Hatlevik, O. E., & Christophersen, K. A. (2013). Digital competence at the beginning of upper secondary school: Identifying factors explaining digital inclusion. *Computers & Education*, 63, 240–247. <https://doi.org/10.1016/j.compedu.2012.11.015>

- Hecker, I., & Loprest, P. (2019). Foundational Digital Skills for Career Progress. In Urban Institute eBooks. Retrieved April 10, 2025, from <https://files.eric.ed.gov/fulltext/ED601774.pdf>
- Ikaningrum, R. E., & Sarwanti, S. (2021). Students' digital literacy in online reading class: a critical reflection on english language learners. *Leksema Jurnal Bahasa Dan Sastra*, 6(1), 1. <https://doi.org/10.22515/ljbs.v6i1.2939>
- Jenkins, H., Ito, M., & Boyd, d. (2016). *Participatory culture in a networked era: A conversation on youth, learning, commerce, and politics*. Polity Press.
- Joubert, M., Larsen, A., Magnuson, B., Waldron, D., Sabo, E., & Fletcher, A. (2023). Global challenges: South African and Australian students' experiences of emergency remote teaching. *Journal of University Teaching and Learning Practice*, 20(4). <https://doi.org/10.53761/1.20.4.09>
- Livingstone, S., Stoilova, M., & Kelly, A. (2017). *Children's data and privacy online: Growing up in a digital age*. London School of Economics and Political Science. Retrieved April 10, 2025, from <https://www.lse.ac.uk/media-and-communications/research/research-projects/children's-data-and-privacy-online>
- Markevica, L., & Dzerviniks, J. (2022). THE IMPACT OF DIGITAL TECHNOLOGIES ON SELF-LEARNING IN MATHEMATICS. *Education Reform Education Content Research and Implementation Problems*, 2, 53. <https://doi.org/10.17770/er2021.2.6726>
- Martínez-Cerdá, J. F., Torrent-Sellens, J., & González-González, I. (2020). Developing digital skills and critical thinking in higher education: The case of Spain. *International Journal of Educational Technology in Higher Education*, 17, Article 24. <https://doi.org/10.1186/s41239-020-00188-x>
- Murray, M., & Pérez, J. (2014). Unraveling the Digital Literacy Paradox: How Higher Education Fails at the Fourth Literacy. *Issues in Informing Science and Information Technology*, 11, 85. <https://doi.org/10.28945/1982>
- 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>
- Onitsuka, K., Hidayat, A. R. T., & Huang, W. (2018). Challenges for the next level of digital divide in rural Indonesian communities. *The Electronic Journal of Information Systems in Developing Countries*, 84(2). <https://doi.org/10.1002/isd2.12021>
- Onwe, S. O., & Ezekwe, E. A. (2014). Handling Digital Divide among Students in Nigerian Tertiary Institutions: A Discourse. *Public Administration Research*, 3(1). <https://doi.org/10.5539/par.v3n1p98>
- Pangrazio, L., Godhe, A.-L., & Ledesma, A. E. G. L. (2020). What is digital literacy? A comparative review of publications across three language contexts [Review of What is digital literacy? A comparative review of publications across three language contexts]. *E-Learning and Digital Media*, 17(6), 442. SAGE Publishing. <https://doi.org/10.1177/2042753020946291>
- Pratolo, B. W., & Solikhati, H. A. (2020). Investigating teachers' attitude toward digital literacy in EFL classroom. *Journal of Education and Learning (EduLearn)*, 15(1), 97. <https://doi.org/10.11591/edulearn.v15i1.15747>
- Prensky, M. (2012). *From digital natives to digital wisdom: Hopeful essays for 21st-century learning*. Corwin Press.

- Rahimi, M., & Yadollahi, S. (2017). ICT use in EFL classes: A focus on EFL teachers' characteristics. *Education and Information Technologies*, 22, 3145–3167. <https://doi.org/10.1007/s10639-017-9572-2>
- Rini, T. A., Cahyanto, B., & Sholihah, F. P. (2020, January 1). The Portraits of Digital Literacy Awareness amid Covid-19 Pandemic. Proceedings of the 5th International Conference on Education and Technology (ICET 2019). <https://doi.org/10.2991/assehr.k.201204.084>
- Salemink, K., Strijker, D., & Bosworth, G. (2015). Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies*, 54, 360. <https://doi.org/10.1016/j.jrurstud.2015.09.001>
- Siddiq, F., Gochyyev, P., & Wilson, M. (2016). Learning in digital networks – ICT literacy: A novel assessment of students' 21st-century skills. *Computers & Education*, 109, 11–37. <https://doi.org/10.1016/j.compedu.2017.01.014>
- Soifah, U., Jana, P., & Pratolo, B. W. (2021). Unlocking digital literacy practices of EFL teachers. *Journal of Physics Conference Series*, 1823(1), 12030. <https://doi.org/10.1088/1742-6596/1823/1/012030>
- Sundeen, T. H., & Sundeen, D. M. (2013). Instructional Technology for Rural Schools: Access and Acquisition. *Rural Special Education Quarterly*, 32(2), 8. <https://doi.org/10.1177/875687051303200203>
- Tinmaz, H., LEE, Y.-T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy [Review of A systematic review on digital literacy]. *Smart Learning Environments*, 9(1). Springer Nature. <https://doi.org/10.1186/s40561-022-00204>
- Tondeur, J., Thys, J., Vanderlinde, R., & van Braak, J. (2022). Teachers' beliefs and technology use: A systematic review. *Educational Technology Research and Development*, 70(1), 73–103. <https://doi.org/10.1007/s11423-021-10002-3>
- Torabi, Z.-A., Rezvani, M. R., Hall, C. M., & Allam, Z. (2023). On the post-pandemic travel boom: How capacity building and smart tourism technologies in rural areas can help - evidence from Iran. *Technological Forecasting and Social Change*, 193, 122633. <https://doi.org/10.1016/j.techfore.2023.122633>
- Valentina, T. F., Arifani, Y., & Anwar, K. (2022). Can Digital Literacy Practices Motivate International Students to Upgrade Their English as a Second Language (L2)? An Ethnography Case Study. *Academic Journal Perspective Education Language and Literature*, 9(2), 99. <https://doi.org/10.33603/perspective.v9i2.6085>
- Van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2014). The digital divide shifts to differences in usage. *New Media & Society*, 16(3), 507–526. <https://doi.org/10.1177/1461444813487959>
- Young, J. A. (2017). Equipping Future Nonprofit Professionals with Digital Literacies for the 21st Century. *Journal of Nonprofit Education and Leadership*, 8(1), 4. <https://doi.org/10.18666/jnel-2018-v8-i1-8309>
- Zhang, J. (2023). EFL teachers' digital literacy: the role of contextual factors in their literacy development. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1153339>
- Zou, Y. L., Kuek, F., Feng, W. Z., & Cheng, X. (2025). Digital learning in the 21st Century: trends, challenges, and innovations in technology integration. *Frontiers in Education*, 10. <https://doi.org/10.3389/educ.2025.1562391>