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Digital Literacy Skills of University Students in English for Specific Purposes (ESP) Learning

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ABSTRACT

English has emerged as a global language, necessitating its mastery among students, particularly given the abundance of learning resources and information accessible online. As a result, digital literacy, defined as the ability to search for and utilize digital information effectively, has become an essential competency. This study aims to examine the digital literacy skills of university students in the context of learning English for specific purposes, namely biology. The investigation focuses on four dimensions of digital literacy: operational skills in using technological devices, critical thinking in digital contexts, digital collaboration abilities, and awareness regarding the appropriate use of digital technologies. Employing a quantitative research design, data were gathered through an online survey distributed to 134 biology students from four universities in Indonesia. The data were analyzed using descriptive statistical techniques. The findings revealed that the students' average digital literacy score was 85.24, which falls within the "outstanding" category. These results highlight the pivotal role of digital literacy in enabling students to access information more effectively and enhance both their disciplinary knowledge and English language proficiency.

Keywords: Digital Literacy skill, ESP, University Students

INTRODUCTION

In the digital era, proficiency in navigating online information has become a fundamental component of academic success, particularly in higher education. For biology students, the ability to access, evaluate, and utilize digital resources in English is essential, as much of the scientific literature and instructional content is available primarily in English. This need becomes even more pronounced in English for Specific Purposes (ESP) learning contexts, where students are required to engage with discipline-specific texts and terminology. Consequently, digital literacy is not only a supportive skill but also a critical factor in facilitating effective ESP learning for biology students.

Digital literacy is increasingly recognized as a core competency in higher education, particularly in English for Specific Purposes (ESP) learning environments. For students in scientific disciplines such as biology, digital literacy enables effective engagement with English-language academic resources, digital platforms, and collaborative tools relevant to their field of study. Recent literature emphasizes that digital literacy encompasses a combination of technical, cognitive, and socio-emotional skills that support learners in navigating, evaluating, and utilizing digital information effectively (Hatlevik et al., 2022; Ng & Nicholas, 2023).

Digital literacy, defined as the ability to search for and utilize digital information effectively, has become an essential competency. For this present study, digital literacy means having the skills

needed to live, learn, and work as an EFL student. Communication and access to information are increasing through digital technologies like internet platforms, social media, and mobile devices.

Digital literacy, according to Noh, (2017), refers to a person's awareness of their attitude and ability to effectively utilize digital tools in identifying, accessing, managing, evaluating, analyzing, and concluding digital resources, as well as acquiring new knowledge, creating expressions, and communicating with others in real-time conditions. Digital literacy includes not only the ability to use devices like computers and mobile phones but also the skill to adapt to their capabilities and limitations in specific situations. Therefore, teachers must have high levels of digital literacy, and students also need to be digitally literate to understand and use information in various formats, such as text, online videos, audio recordings, digital libraries, and databases, from different sources accessible through digital devices.

Digital literacy in higher education has increasingly been regarded as a core competence that goes beyond the technical ability to operate digital tools. The European Digital Competence Framework (DigComp 2.2) conceptualizes digital literacy as a multidimensional construct that encompasses operational skills, critical evaluation, co]llaboration, and ethical awareness in digital environments (Redecker, 2020). Similarly, Hatlevik et al. (2022) and Ng and Nicholas (2023) highlight that digital literacy is not only a prerequisite for academic success but also a foundation for meaningful engagement with discipline-specific learning resources.

In the context of English for Specific Purposes (ESP), digital literacy plays a particularly crucial role, as students are required to access, analyze, and utilize scientific literature that is predominantly published in English. Ilomäki and Lakkala (2019) emphasize that operational competence is a prerequisite for engaging with more complex academic tasks, while Vuorikari et al. (2022) argue that critical digital literacy enables students to distinguish between credible scholarly sources and unreliable online content. Thus, digital literacy supports not only technical fluency but also evidence-based reasoning, which is essential in science-related ESP learning.

Collaborative dimensions of digital literacy are also relevant in ESP education. García-Martín and García-Sánchez (2021) found that collaborative practices using cloud-based documents, online discussion forums, or academic social networks foster learner autonomy and strengthen communication skills. For biology students, such practices provide opportunities to engage with scientific terminology in English while simultaneously developing critical dialogue and teamwork in digital spaces.

Ethical and legal awareness form another vital aspect of digital literacy. Noh (2017) stresses that digital literacy includes an individual's awareness of plagiarism, copyright, data privacy, and online safety. This perspective aligns with Radovanović et al. (2020), who frame ethical digital practices as part of digital citizenship, encouraging responsible and respectful engagement in academic communities. For biology students working within ESP contexts, such competencies are fundamental for maintaining academic integrity and professionalism.

Although much of the existing literature has addressed digital literacy in general, there remains a gap in research specifically linking digital literacy to ESP learning in scientific disciplines such as biology. Previous studies have often focused on teacher digital competence (Quaicoe & Pata, 2020; Reisoğlu & Çebi, 2020) or on elementary students in e-learning contexts (Kerkhoff & Makubuya, 2021), leaving relatively few studies exploring how science students navigate English-language resources to support their disciplinary learning. This study, therefore, contributes to filling that gap by examining biology students' digital literacy in ESP contexts across four dimensions: operational skills, critical literacy, digital collaboration, and ethical awareness.

This study adopts four interrelated dimensions of digital literacy, operational skills, critical thinking in digital contexts, digital collaboration, and ethical awareness to explore their relevance to ESP learning among biology students. Operational skills refer to the ability to use digital tools and platforms proficiently. These include managing basic software applications, navigating learning management systems (LMS), and accessing academic databases or web-based scientific materials in English. Such foundational skills are essential for biology students in ESP settings, where the majority of relevant content is published in digital, English-language formats. According to Ilomäki and Lakkala (2019), operational digital competence is a prerequisite for engaging in more advanced forms of academic and digital learning.

Critical digital literacy involves the capacity to analyze, interpret, and evaluate information found online. In scientific ESP contexts, where information must be accurate and evidence based, students must learn to differentiate between reliable academic sources and non-credible content. As Vuorikari et al. (2022) highlight, digital critical thinking is essential for information validation, especially in domains where students rely heavily on English language research for learning. This skill helps students make informed academic decisions and supports scientific reasoning.

Digital collaboration refers to students' ability to work with others using digital tools whether through cloud-based documents, online discussion forums, or academic social networks. In ESP learning, these interactions often take place in English and support both language development and subject-matter engagement. Research by García-Martín and García-Sánchez (2021) shows that collaborative digital practices not only enhance communication skills but also foster learner autonomy and critical dialogue, both of which are crucial in science-based ESP instruction.

Digital literacy also involves an understanding of ethical, responsible, and safe digital behavior. This includes familiarity with issues such as plagiarism, copyright, data privacy, and digital etiquette. For students engaging with academic English content online, especially in fields like biology where academic integrity is vital, such awareness is essential. As Redecker (2020) argues, ethical digital competence forms a key aspect of "digital citizenship," promoting accountability and respectful engagement in academic communities.

This study aims to investigate the digital literacy skills of university students in the context of English for Specific Purposes (ESP) learning. Specifically, it explores how students search for, assess, and apply online information in English to support their academic tasks in biology. The investigation focuses on four dimensions of digital literacy: operational skills in using technological devices, critical thinking in digital contexts, digital collaboration abilities, and awareness regarding the appropriate use of digital technologies.

METHOD

This study adopted a quantitative descriptive research design with the purpose of examining the digital literacy skills of university students in the context of English for Specific Purposes (ESP) learning. The participants were 134 undergraduate biology students drawn from four universities in Indonesia, recruited through convenience sampling. Demographic information such as gender, academic year, and access to digital devices and internet connectivity was collected to provide additional context for interpreting the findings. Participation was voluntary, and informed consent was obtained prior to data collection.

Data were collected through a structured digital literacy questionnaire designed to measure four interrelated dimensions: operational skills, critical digital literacy, digital collaboration, and ethical or legal awareness. The questionnaire included items addressing students' ability to join and navigate LMS classes, interpret digital symbols, communicate through online platforms, select and evaluate information from the internet, produce reliable sources, and critically assess digital content. Responses were recorded using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument underwent expert validation to ensure content appropriateness, followed by a pilot test to check item clarity. Reliability was assessed using Cronbach's alpha, and all subscales met the recommended threshold of $\alpha \geq .70$.

The survey was administered online through a secure link distributed via institutional channels, and responses were collected over a one-month period. All data were anonymized before analysis. Descriptive statistical techniques, including mean, standard deviation, frequency, and percentage, were applied to examine overall and dimension-specific digital literacy scores. In addition, tests for normality and homogeneity of variance were conducted to assess data distribution. The Shapiro–Wilk and Levene's tests indicated no evidence against normality and homogeneity ($p > .05$), supporting the appropriateness of the descriptive analysis.

Ethical approval was obtained from the research ethics committee of Universitas PGRI Sumatera Barat. To ensure confidentiality and research integrity, all responses were stored securely and used only for academic purposes.

Table 1. Criteria for Digital Literacy Ability

No	Interval	Category
1	84< X ≤ 100	Very good
2	68 < X ≤ 84	Good
3	52 < X ≤ 68	Enough
4	36 < X ≤ 52	Not enough
5	0 < X ≤ 36	Very less

(Pratama et al., 2019)

FINDINGS AND DISCUSSION

The digital literacy ability of university students is gotten by using an online questionnaire. The investigation focuses on four dimensions of digital literacy: operational skills in using technological devices, critical thinking in digital contexts, digital collaboration abilities, and awareness regarding the appropriate use of digital technologies. The results of digital literacy skills of Biology students can be seen in Table 2.

Table 2. Descriptive Statistics Digital Literacy of university Students

Dimension of Digital Literacy	Category %				
	Very good	Good	Enough	Not enough	Very less
Operational skills in using technological devices (Keterampilan Mengoperasikan)	55.30	40.40	4.30	0	0
Critical thinking in digital contexts (Keterampilan Berfikir)	40.40	52.20	6.40	0	0
Digital collaboration abilities (Keterampilan Kolaborasi)	57.40	38.30	4.30	0	0
Awareness to the appropriate use of digital technologies (Keterampilan Berkesadaran)	78	19.10	2.10	0	0

Based on Table 2, it can be seen that the digital literacy abilities of Biology students are mostly in the very good category with the average score was 85.24. In the first dimension, namely operating skills in using digital devices there are 55.30% of students in the very good category, 40.40% of students in the good category, and 4.30% of students in the enough category. It means that Biology students have very good ability to understand the function and use of basic and digital technology devices, to find, select, and evaluate digital tools or applications for learning purposes. This describes high-level digital literacy, where students can effectively use basic and digital tools to find, evaluate, and apply information for learning purposes. These skills are crucial in today's world for achieving academic success and navigating a technology-driven society .Also, Biology students have very good ability to present information or data using digital tools or platforms. Digital learning tools and technologies provide enjoyment for students and numerous benefits for their overall development. Digital learning allows students to access more knowledge and ensures that content can be tailored and adapted to their specific needs.

The second dimension is critical thinking in digital contexts. Students who are in the very good category are 40,40%. While, students who are in the good category are 52.20%. Then, students who are in the enough category are 6.40%. It can be conclude that Biology students have very good ability in analyse. In this case, they have the ability to break down digital information into its components and understand the relationships between these components. In evaluation, Biology students have good ability to assess the quality, credibility, and relevance of the information or digital technology used. Effective evaluation requires critical thinking and skills such as checking for accuracy, authority, bias, and timeliness, as outlined in the information literacy framework. Teaching students to conduct these evaluations is crucial to their academic and overall success. In creativity, Biology students have the ability to create and modify digital content in an original and innovative

way. Students can create and modify digital content in original and innovative ways through tools such as text editors, image and video creation software, and interactive platforms, fostering creativity, critical thinking, and problem-solving skills. This process allows them to take ownership of their learning by expressing ideas through a variety of media, such as mind maps, infographics, animations, and videos.

The third dimension is digital collaboration abilities. There are 57.40% students in the category very good, 38.30% students in the category good, and 4.30% students in the category enough. It means that Biology students have very good ability to collaborate digitally in completing tasks or projects with a team (Teamwork), to build and maintain academic or professional networks digitally (Networking), and to share information, ideas, or work results digitally with ethics and responsibility (Sharing). Effective teamwork and collaboration are considered essential to student learning. Working in teams helps students develop problem-solving, communication, and critical thinking skills, and provides them with opportunities to collaborate with and learn from their peers.

Interestingly, in the fourth dimensions, namely awareness of appropriate use of digital technologies, there are 78% of students in the very good category, 19.10% of students in the good category, and 2.10% of students in the enough category. It can be said that Biology students have very good awareness and application of digital ethics in behaving in digital space (Ethics), understanding of the rules and laws that apply to the use of digital technology (Legal Literacy) and have the ability to protect themselves from digital risks such as fraud, bullying, and identity theft (Self-Safety). Students who possess strong digital ethics, legal literacy, and personal safety skills are well-equipped for responsible and safe online engagement. This means they understand and apply digital ethics to online behavior, understand relevant digital laws and regulations, and can protect themselves from online risks such as fraud and cyberbullying. Cultivating these skills is crucial to creating a positive and safe digital environment for all users.

These results highlight the pivotal role of digital literacy in enabling students to access information more effectively and enhance both their disciplinary knowledge and English language proficiency. EFL students are required to access a wide variety of information available on the internet In the era of rapid information. Therefore, they need to utilize their digital literacy effectively, including evaluating and synthesizing information, and collaborating with others through online facilities (Frisch et al., 2018). By developing these skills through digital tools, students can also develop inquiry-based learning, which enhances critical thinking and self-efficacy (Frisch et al., 2013).

CONCLUSION

This study investigates the digital literacy ability of university students that focuses on four dimensions of digital literacy: operational skills in using technological devices, critical thinking in digital contexts, digital collaboration abilities, and awareness regarding the appropriate use of digital technologies. The present study reported a high mean self-reported digital literacy score (M = 85.24) among the sampled, with strongest self-assessments appearing in operational and collaborative dimensions. These findings suggest that students perceive themselves as relatively confident in using digital platforms and participating in digital teamwork, capabilities that are potentially supportive of English for Specific Purposes (ESP) activities.

Accordingly, rather than claiming a definitive causal link between digital literacy and ESP achievement, the more defensible conclusion is that self-reported digital literacy among these biology students appears high and may support ESP learning, but further evidence is needed. Future research should triangulate self-reports with objective measures (task-based assessments, LMS activity logs, and instructor evaluations), report instrument reliability and score distributions, and examine subgroup differences (by institution, year, and access to technology). Pedagogically, instructors are advised to complement operational training with explicit instruction in critical evaluation of English-language scientific sources, reference management, and digital ethics to translate perceived competence into demonstrable academic skills.

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