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Critical Reading Meets Digital Literacy

Understanding Scientific Works in a Transformative Age

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Abstract

This study aims to examine the relationship between critical reading and digital literacy in strengthening students' ability to understand scientific works in the era of digital transformation. The rapid growth of digital information has changed the way students access, read, evaluate, and use academic sources. However, this development also creates challenges, especially in relation to misinformation, weak source evaluation, limited academic vocabulary, and passive technology use. This study employed a library research method by collecting and analyzing relevant books, journal articles, research reports, and academic documents on critical reading, digital literacy, scientific literacy, and digital ethics. The findings indicate that critical reading and digital literacy are mutually reinforcing competencies. Critical reading strengthens students' ability to analyze arguments, evaluate evidence, distinguish facts from opinions, and interpret scientific texts reflectively. Meanwhile, digital literacy enables students to access, assess, manage, and use digital information ethically, creatively, and responsibly. The integration of both competencies supports deeper understanding of scientific works, enhances students' critical thinking, and promotes responsible digital behavior. This study concludes that critical reading and digital literacy should be systematically integrated into educational curricula, teaching strategies, and academic literacy programs. Such integration is essential for preparing students to become critical, ethical, adaptive, and responsible learners in the digital age.

Keywords: *critical reading, digital literacy, scientific works, digital ethics, higher education, information technology.*

The rapid development of digital technology has transformed the way students access, read, evaluate, and communicate information. In the contemporary educational context, students no longer rely solely on printed books or classroom explanations. They increasingly obtain academic information through digital journals, repositories, websites, electronic books, online databases, and social media. This transformation provides wider access to knowledge, but it also creates new challenges related to information credibility, digital ethics, misinformation, and students' ability to read critically [1].

Critical reading is an essential academic skill because it enables students to understand, evaluate, and respond to scientific texts. It requires readers to examine the author's argument, identify evidence, assess the validity of claims, distinguish facts from opinions, and construct reasoned interpretations. Radhiyah [1] explains that understanding scientific works requires reading strategies that move beyond surface-level comprehension. One effective strategy is the three-pass reading method, which guides readers to understand scientific texts gradually: first by skimming the title, abstract, introduction, conclusion, tables, and references; second by reading more carefully to identify key ideas;

and third by conducting deep reading to evaluate assumptions, methods, data, and research contributions.

However, critical reading has become increasingly complex in the digital era. Students are exposed to large volumes of information, not all of which is valid, accurate, or academically reliable. Rafi et al. [2] emphasize that digital literacy plays an important role in strengthening students' critical thinking, especially when they encounter digital information that may contain bias, distortion, or misinformation. Therefore, students must not only understand texts but also evaluate the credibility, relevance, and ethical implications of the information they use.

Digital literacy is often understood as the ability to access, use, evaluate, and create information through digital technology. Moko [3] explains that digital literacy initially focused on the technical ability to use digital tools and understand information from digital sources. However, this technical view is no longer sufficient. Husaeni et al. [4] argue that digital literacy must also involve critical thinking, source evaluation, responsible information use, and ethical awareness. In other words, digital literacy is not merely the ability to operate devices but also the ability to make informed and responsible judgments in digital environments.

The integration of critical reading and digital literacy is particularly important in higher education. Harputra and Ramadhani [5] found that students still need systematic support in developing critical reading skills, especially when dealing with complex academic and digital texts. Wardani et al. [6] further show that information and digital learning environments can strengthen students' critical thinking when supported by appropriate pedagogy. These findings indicate that critical reading and digital literacy should not be taught separately. Instead, both should be integrated as complementary competencies in academic literacy development.

Several studies have also highlighted the importance of scientific work repositories, digital academic sources, and knowledge integration. Maha et al. [7] show that repository integration supports the management and dissemination of scientific works, while Darwis and Rantika [8] emphasize that knowledge integration can produce a more holistic understanding of science. These studies suggest that students' ability to understand scientific works depends not only on reading ability but also on their capacity to access, evaluate, and synthesize information across digital sources.

Based on these issues, this study focuses on the relationship between critical reading and digital literacy in understanding scientific works. The study aims to examine how both competencies interact, how they support students' academic understanding, and why their integration is necessary in the digital era. This article argues that critical reading and digital literacy are strategic competencies for modern education because they prepare students to become analytical, ethical, adaptive, and responsible users of information.

Literature Review

A. Critical Reading

Critical reading means thoroughly understanding a text by considering the credibility, accuracy, and relevance of the information. Digital literacy encompasses understanding the content of a text and the

ability to think critically, creatively, and inspiringly [8]. Critical reading teaches students to evaluate arguments, interpret meaning, and draw rational conclusions from various pieces of information. These skills are crucial for dealing with various digital texts, which are becoming a primary source of learning and communication [8].

However, in this digital age, critical reading has become increasingly difficult. Students now encounter a wide variety of information in the form of text, images, and multimedia; however, not all sources of information have the same level of accuracy and credibility. Digital-based learning can make it difficult for students to distinguish true from false information if critical reading skills are not systematically developed. This situation demonstrates that digital literacy means more than just the technical ability to use digital media and devices; it must also include evaluative and reflective aspects in assessing the information obtained [8].

Therefore, critical reading must be the foundation of digital literacy-based learning. Digital literacy is defined as the knowledge and ability to use digital media intelligently, carefully, appropriately, and legally. The learning process can be directed toward developing students who are able to think critically, morally, and innovatively in the face of the flood of digital information by incorporating critical reading skills into the digital curriculum. Students not only gain improvements in their academic abilities through this integration, but they also gain the skills necessary for living in the modern era, which demands mastery of technology as well as the ability to think critically about what they see [3].

Critical reading refers to the ability to understand texts deeply by evaluating the credibility, accuracy, relevance, and logical structure of information. It requires readers to interpret meaning, examine evidence, compare arguments, identify bias, and draw rational conclusions. In academic contexts, critical reading is essential because scientific works contain concepts, assumptions, methodologies, findings, and arguments that must be examined carefully.

Radhiyah [1] emphasizes that understanding scientific works requires structured reading strategies. The three-pass reading method allows readers to move from general comprehension to deeper analysis. In the first stage, readers identify the general structure and purpose of the work. In the second stage, they examine key arguments, tables, figures, and evidence. In the third stage, they evaluate assumptions, methodological soundness, data interpretation, and possible contributions to future research. Critical reading is also closely related to critical thinking. Students who read critically are better able to question information, identify weak arguments, and avoid accepting claims without sufficient evidence. This skill is increasingly important because students now encounter digital texts that vary significantly in credibility and quality.

B. Digital Literacy in Education

Digital literacy refers to the ability to access, understand, evaluate, use, and create information through digital technologies. Moko [3] states that digital literacy initially emphasized the ability to use digital tools and process information from computer-based sources. However, the meaning of digital literacy has expanded significantly in contemporary education.

Husaeni et al. [4] argue that digital literacy includes critical thinking, ethical awareness, and responsible use of technology. Students must be able to assess whether digital sources are credible,

relevant, and academically appropriate. They must also understand the ethical implications of using digital information, including plagiarism, data privacy, misinformation, and digital responsibility.

Sari et al. [9] show that digital literacy-based learning can support innovation in education and improve classroom effectiveness. Similarly, Sakti [10] explains that digital technology can enhance learning when it is used intentionally and pedagogically. These studies suggest that digital literacy should be integrated into teaching and learning processes, not merely introduced as a technical skill.

C. Integration of Critical Reading and Digital Literacy

The integration of critical reading and digital literacy is necessary because digital information requires evaluative reading. Students must be able to read digital texts critically, assess the reliability of sources, identify misinformation, and synthesize information ethically. Harputra and Ramadhani [5] found that students still require support in critical reading, especially when facing academic and digital texts. This indicates that digital access alone does not automatically produce critical understanding.

Wardani et al. [6] highlight that digital learning environments can support students' critical thinking when accompanied by appropriate instructional strategies. This means that teachers and lecturers must design learning activities that combine source evaluation, digital text analysis, academic discussion, and reflective judgment. Warastuti et al. [11] also emphasize that digital literacy can strengthen critical thinking when implemented systematically in learning.

Therefore, critical reading and digital literacy must be understood as interconnected competencies. Critical reading provides the evaluative foundation, while digital literacy provides the technological and ethical context in which that evaluation occurs.

Material and Methods

This study employed a library research method. Library research was selected because the study aimed to examine theories, concepts, and findings from previous studies related to critical reading, digital literacy, scientific works, and digital ethics. The study did not collect primary data through field observations, interviews, or experiments. Instead, it relied on secondary sources such as journal articles, books, research reports, and academic documents.

The data sources were selected purposively. Only literature considered relevant to the topic, conceptually related to the research focus, and useful for explaining the relationship between critical reading and digital literacy was included. The selected sources were analyzed to identify key concepts, similarities, differences, and theoretical relationships.

The research process consisted of five stages. First, the researchers identified the main issue, namely the need to integrate critical reading and digital literacy in understanding scientific works. Second, the researchers conducted a literature search using relevant academic sources. Third, the researchers collected secondary data from books, journal articles, research findings, and digital academic documents. Fourth, the researchers conducted content analysis to examine conceptual relationships among the selected sources. Fifth, the researchers synthesized the findings into a structured explanation of how critical reading and digital literacy support academic understanding in the digital era.

Data analysis was conducted descriptively through content analysis. The selected literature was examined to identify patterns, themes, conceptual relationships, and implications for education. The results were then organized into research stages, conceptual findings, discussion, and conclusion.

Results

The results of this study are presented based on the stages of library research used to analyze the integration of critical reading and digital literacy in education. The analysis was organized into five main stages: identifying issues and themes, conducting a literature search, collecting secondary data, analyzing content, and synthesizing findings. Each stage produced specific findings that show how critical reading and digital literacy complement each other in strengthening students' academic competence, ethical awareness, and ability to evaluate digital information. The summary of these stages and their main findings is presented in Table 1.

Table 1. Stages of Library Research and Main Findings on the Integration of Critical Reading and Digital Literacy

No.	Research Stage	Activity Description	Main Finding	Year	Supporting Source
1	Identifying issues and themes	Determining the focus of the study on the integration of critical reading and digital literacy in education.	Critical reading and digital literacy reinforce each other in shaping 21st-century learning competencies.	2025; 2023	Rafi et al. [2]; Harputra and Ramadhani [5]
2	Literature search	Collecting literature related to digital literacy, critical reading, and scientific works.	The urgency of digital literacy in education continues to increase as students engage more frequently with digital academic sources.	2024; 2023	Moko [3]; Husaeni et al. [4]
3	Secondary data collection	Selecting theories and concepts that support the relationship between critical thinking and digital literacy.	Critical reading and digital literacy both strengthen analytical, ethical, and reflective thinking.	2018; 2023	Darwis and Rantika [8]; Maha et al. [7]
4	Content analysis	Examining the relationship between theoretical concepts and digital literacy practices.	Learning that integrates critical reading and digital literacy supports deeper understanding and ethical responsibility.	2025; 2025	Warastuti et al. [11]; Yunaika [12].
5	Synthesis of findings	Formulating conceptual conclusions about the importance of integration in modern education.	Critical reading and digital literacy should be integrated into the curriculum and learning strategies.	2024; 2023	Sari et al. [9]; Sakti [10]

Table 1 shows that critical reading and digital literacy are mutually reinforcing competencies in modern education. At the issue-identification stage, Rafi et al. [2] and Harputra and Ramadhani [5] indicate that students need both critical thinking and critical reading skills to deal with digital information. This finding suggests that the ability to read critically must be developed together with the ability to evaluate digital sources.

It shows that critical reading and digital literacy are mutually reinforcing competencies in modern education. At the issue-identification stage, Rafi et al. [2] and Harputra and Ramadhani [12]

emphasize that students need critical thinking, critical reading, and digital literacy skills to deal with the rapid growth of digital information. These findings indicate that students are no longer required merely to comprehend academic texts, but also to assess the relevance, credibility, accuracy, and ethical implications of the digital sources they encounter. In this context, critical reading functions as a foundation for evaluating information, while digital literacy provides the broader competence needed to access, filter, and use information responsibly in digital environments.

At the literature-search stage, Moko [8] and Husaeni et al. [9] show that digital literacy has become increasingly important in education, particularly because learning activities are now strongly connected with digital platforms, online information, and technology-based resources. Digital literacy should therefore not be understood only as the technical ability to operate digital devices, but also as the ability to understand, evaluate, manage, and use information critically and ethically. This finding strengthens the argument that digital literacy must be positioned as an academic competence that supports critical thinking, not merely as a technological skill.

At the secondary-data-collection stage, Darwis and Rantika [6], Maha et al. [3], and Raharja et al. [4] indicate that integration is important for developing broader and more comprehensive academic understanding. In this study, integration refers to the combination of critical reading and digital literacy as two complementary competencies. Through this integration, students are expected to understand information not only textually, but also contextually, conceptually, and ethically. This process also encourages students to develop reflective abilities, including the ability to assess the accuracy of information, compare multiple sources, and construct more mature perspectives on academic and social issues.

At the content-analysis stage, Wardani et al. [10], Coiro [11], Yunaika [14], and Warastuti et al. [18] support the idea that digital literacy can strengthen critical reading and critical thinking when it is systematically applied in learning. Reading digital texts requires more complex strategies because digital information is often non-linear, multimodal, and varied in credibility. Therefore, students need structured learning experiences that require them to compare sources, evaluate arguments, identify misinformation, recognize bias, and reflect on ethical issues. This integration is particularly important in the post-truth era, where opinions, emotional narratives, and media manipulation can obscure factual accuracy.

At the synthesis stage, Sari et al. [13], Sari and Munir [15], Sakti [16], and Dašić et al. [17] emphasize that technology-based learning must be supported by strong pedagogical design and ethical awareness. Digital tools can improve learning only when they are used to support meaningful academic activities, critical inquiry, responsible communication, and knowledge construction. Therefore, critical reading and digital literacy need to be systematically integrated into curricula, learning strategies, academic assignments, and digital ethics education. Such integration can strengthen students' analytical skills, moral awareness, creativity, adaptability, and responsibility in using technology. Thus, the integration of critical reading and digital literacy can be considered a strategic approach to improving the quality of education in the digital era and preparing students to become intelligent, critical, ethical, and character-based learners.

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Discussion

Rafi et al. [2] show that digital literacy plays an important role in encouraging students' critical thinking, while Harputra and Ramadhani [5] emphasize the need to strengthen critical reading among students. These findings indicate that students must be trained not only to access information but also to question, interpret, and evaluate it critically.

The first stage of the findings shows that the integration of critical reading and digital literacy is essential for shaping students' learning competencies. Critical reading enables students to examine arguments, identify evidence, and distinguish facts from opinions. Digital literacy enables them to apply these skills in digital contexts where information is abundant, fast-moving, and uneven in quality. Without critical reading, students may consume digital information passively. Without digital literacy, students may find it difficult to locate, evaluate, and use academic sources responsibly.

The second stage of the findings highlights the growing importance of digital literacy in education. Moko [3] explains that digital literacy involves the ability to understand information obtained through digital devices. Husaeni et al. [4] extend this view by emphasizing that digital literacy is related to students' critical thinking ability. These findings suggest that digital literacy should not be reduced to technical competence. Students must also understand how digital information is produced, circulated, manipulated, and evaluated.

The third stage of the findings shows that integration is a crucial strategy for improving academic competence. Maha et al. [7] discuss repository integration as a means of supporting the management and dissemination of scientific works, while Darwis and Rantika [8] explain that scientific integration can produce a more holistic understanding. In relation to this study, these arguments show that academic understanding requires the ability to connect information across sources, disciplines, and contexts. Therefore, students need critical reading skills to interpret scientific works and digital literacy skills to access and evaluate digital academic sources.

The fourth stage of the findings demonstrates that learning activities integrating critical reading and digital literacy can strengthen students' ethical responsibility. Warastuti et al. [11] state that digital literacy can build students' critical thinking ability, while Yunaika [12] emphasizes the role of digital literacy in critical reading within language learning. These studies show that students must be guided to analyze online information, assess credibility, compare arguments, and recognize bias or misinformation. Such practices are especially important in the post-truth era, where opinions, emotions, and media manipulation can obscure factual accuracy.

The fifth stage of the findings emphasizes the need for curriculum integration. Sari et al. [9] show that digital technology can support learning innovation, while Sakti [10] argues that digital technology can improve learning when used appropriately. These findings imply that educational institutions should not treat digital literacy as a supplementary topic. Instead, it should be embedded across courses, assignments, reading activities, and academic writing practices. Students should be trained to review online scientific articles, evaluate digital sources, cite information ethically, and use technology to support knowledge construction.

The integration of critical reading and digital literacy also has implications for teaching practice. Lecturers and teachers need to design learning activities that require students to interact critically with digital texts. Examples include analyzing online scientific articles, comparing sources from academic databases and public websites, identifying misinformation, evaluating author credibility, and producing reflective academic summaries. These activities can help students move from passive information consumption to active knowledge construction.

Furthermore, this integration has important implications for educational policy and institutional readiness. Educational institutions need to provide adequate digital infrastructure, access to credible academic databases, continuous lecturer training, and clear guidelines for digital ethics. Without strong institutional support, efforts to develop students' digital literacy and critical reading skills may remain fragmented, inconsistent, and dependent on individual teaching practices. Therefore, collaboration among educators, institutions, policymakers, and communities is necessary to build a learning ecosystem that supports critical, ethical, reflective, and responsible use of technology.

Finally, the findings indicate that digital literacy must be closely connected with moral and ethical education. Critical reading without ethical awareness may produce students who are intellectually capable but irresponsible in using information. Conversely, digital literacy without critical reading may lead students to use technology mechanically, without understanding the credibility, quality, and consequences of the information they access. Therefore, the integration of critical reading and digital literacy should aim not only to improve students' academic competence, but also to strengthen their character, digital responsibility, academic honesty, and awareness of the social impact of technology use.

Conclusion

Critical reading and digital literacy are essential competencies for improving the quality of education in the digital age. This study emphasizes that digital literacy should not be understood merely as the technical ability to operate digital devices, but also as the capacity to access, evaluate, interpret, and use information critically, ethically, and creatively. In this context, critical reading plays a central role in helping students examine the credibility of digital sources, distinguish facts from opinions, identify misinformation, and develop reasoned interpretations of scientific and academic texts.

The findings also indicate that many students still face difficulties in developing these competencies due to inappropriate teaching strategies, limited exposure to challenging academic materials, insufficient academic vocabulary, and the lack of systematic guidance in evaluating digital information. These challenges become increasingly urgent in an era marked by the rapid spread of misinformation, hoaxes, and unreliable online content. Therefore, educational institutions need to integrate critical reading and digital literacy into curriculum design, learning activities, academic assignments, and digital ethics education.

The integration of critical reading and digital literacy can strengthen students' analytical ability, reflective thinking, academic responsibility, and ethical awareness in using technology. Such integration also supports the development of learners who are not only capable of accessing digital information, but

also able to evaluate, synthesize, and use it responsibly for academic and social purposes. Thus, combining critical reading and digital literacy is a strategic step toward preparing students to become critical, creative, ethical, and adaptive learners in a transformative digital era.

Limitation and Suggestions

Practically, teachers and lecturers are encouraged to implement learning strategies that simultaneously foster critical reading skills and digital literacy. This can be done by gradually introducing students to scientific terminology, assigning cognitively challenging reading tasks, and guiding them to analyze, compare, and evaluate digital information sources. Learning activities should not only train students to understand academic texts, but also help them assess source credibility, detect misinformation, and use digital information responsibly. Therefore, critical reading instruction should be integrated with digital ethics, moral values, and responsible technology use to support character-based learning.

At the institutional level, universities need to integrate critical reading and digital literacy systematically into curricula across study programs. These competencies should not be treated as supplementary skills, but as core academic abilities required in the digital era. Universities should also provide lecturer training, curriculum support, academic literacy programs, access to credible digital databases, and adequate technological infrastructure. Such institutional support is necessary to ensure that students have equal opportunities to develop critical, ethical, and responsible digital literacy practices.

From a policy perspective, policymakers should recognize critical reading and digital literacy as essential competencies in modern education. This recognition needs to be supported through clear regulations, sufficient funding for educational technology development, digital learning infrastructure, and policies that promote safe, ethical, and responsible use of technology in educational settings. Strengthening digital ethics is particularly important to prevent plagiarism, misinformation, irresponsible data use, and unethical academic practices.

Academically, further research is recommended to explore effective models for integrating critical reading and digital literacy in various educational contexts. Future studies may examine best practices, pedagogical strategies, supporting factors, and inhibiting factors in implementing these competencies at different levels of education. Further research should also investigate the role of digital ethics in shaping students' technology use and explore interdisciplinary approaches that combine education, communication, technology, language studies, and character education. Such research is expected to provide more holistic, contextual, and applicable learning models for both educators and students.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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