IMPROVING DIGITAL LITERACY AND CRITICAL THINKING OF ELEMENTARY SCHOOL STUDENTS THROUGH THE DIGITAL CITIZENSHIP TEACHING MODULE

[*1]Muhammad Khoirul Huda,[2]Agus Setyo Budi,[2]Erry Utomo

[1]Doctor of Elementary Education
Universitas Negeri Jakarta, Indonesia
[2]Natural Sciences, Mathematics and Natural Sciences
Universitas Negeri Jakarta, Indonesia
[3]Basic Education, Postgraduate
Universitas Negeri Jakarta, Jakarta, Indonesia

*Corresponding author:*mhudakhoirul25@gmail.com

Abstract. *The rapid development of digital technology requires strengthening digital literacy competencies and critical thinking skills from an early age, especially in elementary school students. This research aims to improve students' digital literacy and critical thinking skills through the application of Digital Citizenship teaching modules that are designed systematically and contextually. The method used is research and development with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. The subject of the study was a grade V student at an elementary school in Bima City. The instruments used included questionnaires, observation sheets, and critical thinking tests. The results of the study show that the use of the Digital Citizenship teaching module significantly improves students' understanding of the ethics of digital media use, digital security, and responsibility as digital citizens. In addition, there is an increase in students' critical thinking skills in responding to digital information in a reflective and logical manner. Thus, this module is effective as an innovative learning medium to strengthen 21st century competencies in primary school students.*

Keywords: *Critical Thinking; Digital Citizenship; Digital Literacy; Elementary School Students; Teaching Modules*

1. INTRODUCTION

The development of digital technology has brought significant changes in various aspects of human life, including in the world of education (Setiawan, 2023). In the era of the industrial revolution 4.0 and society 5.0, the ability to access, evaluate, and use digital information has become a very important skill (Pangestuti et al., 2024). Therefore, digital literacy is the main competency that every individual must have from an early age, including elementary school students (Salamah et al., 2022).

Digital literacy not only refers to technical abilities in using technological devices, but also includes a critical understanding of information circulating in cyberspace, as well as the wise and responsible use of technology (Putri & Masrum, 2025). Digital literacy is part of the new literacy that is in line with the demands of the 21st century and is part of the Pancasila student profile proclaimed in the Merdeka Curriculum (Madani et al., 2025).

In the context of basic education, students need to be introduced to various aspects of digital literacy from an early age so that they are able to adapt to a technology-based learning and social environment (Luhukay et al., 2024). Elementary school-age children are currently growing up as digital natives, namely a generation that has been accustomed to digital technology since childhood (Fajarwati & Rahmawati, 2025). However, this habit is not always accompanied by critical thinking skills and ethical awareness in using technology (Umayah & Riwanto, 2020).

This condition shows that there is a gap between students' technical ability to access technology and critical thinking skills as well as moral responsibility in their use (Wulandari et al., 2025). Many students are able to use their devices and browse the

internet, but are not yet able to distinguish between valid and invalid information, or understand the consequences of their actions in the digital space (M. S. Putri & ., 2021).

One of the important cognitive skills to develop along with digital literacy is critical thinking (Ratri et al., 2023). Critical thinking includes the ability to analyze information, evaluate sources, make logical decisions, and solve problems reflexively (Gandara, 2024). In the context of education, critical thinking helps students to become active learners who not only receive information, but are also able to question it constructively (Sulianta, 2020).

The combination of digital literacy and critical thinking is an important foundation in forming intelligent and responsible digital citizens. Formal education has a strategic role in instilling these two competencies through a structured and contextual learning process. One of the strategies that can be applied is to develop and use teaching modules with the theme of digital citizenship (Anggraeni et al., 2019).

Digital citizenship is a concept that teaches students how to be ethical, safe, responsible, and socially active users of technology. Teaching modules that focus on digital citizenship can provide students with a broader understanding of the rights and obligations of digital citizens, internet ethics, digital security, data privacy, and the impact of online interactions (Kuncoro et al., 2022).

The implementation of digital citizenship teaching modules in elementary schools can be an innovative solution in answering the challenges of digital literacy and students' low critical thinking skills. (Zahra & Ritonga, 2024) These modules can be structured with an approach that is appropriate to the characteristics of primary school-age children, who tend to prefer contextual, activity-based, and visual learning.

In the teaching module, students are invited to be actively involved in discussions, simulations, case studies, as well as small projects related to the digital world they are familiar with (Mulyati & Meiningdias, 2022). Learning not only takes place cognitively, but also touches affective and psychomotor aspects, so that digital citizenship values can be embedded comprehensively (Sianipar et al., 2024).

Various studies show that well-designed digital citizenship education can increase students' ethical awareness in using technology, as well as encourage critical attitudes in responding to online information. This is especially relevant in dealing with the rampant spread of hoaxes, cyberbullying, and unwise use of social media among children and adolescents (Setianingsih et al., 2024).

Unfortunately, not many elementary schools in Indonesia explicitly include the theme of digital citizenship in their learning curriculum. Teachers are still limited in teaching and training resources related to teaching digital literacy and digital citizenship. As a result, information technology learning tends to focus solely on technical aspects, such as typing or using software.

This condition strengthens the urgency of developing digital citizenship teaching modules that can be used practically in the classroom and adjusted to the needs of the curriculum. The module is not only important for improving students' knowledge, but also plays a role in the formation of positive and adaptive digital characters (Husna, 2023).

The development of this teaching module is also in line with the spirit of the Independent Curriculum which encourages the strengthening of cross-disciplinary competencies, project-based learning, and the development of Pancasila student profiles. Values such as critical reasoning, independence, and global diversity are closely related to digital literacy and digital citizenship education (Susanto et al., 2025).

In its implementation, the digital citizenship teaching module can be integrated into subjects such as Pancasila Education, Indonesian, and Social Sciences. This integration will make it easier for teachers to deliver material thematically and relevant to students' daily lives (Naimah et al., 2024).

This teaching module can also be developed with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) approach so that it has a systematic and tested structure. This process ensures that the modules are not only content-valid, but also practical and effective when used in learning (Maisaroh et al., 2025).

This research focuses on the development and implementation of digital citizenship teaching modules as an effort to improve digital literacy and critical thinking of elementary school students. The research was conducted on grade V students, who psychologically have entered the phase of concrete operational thinking and are beginning to be able to understand moral and social concepts in a more complex way.

The instruments used to measure the effectiveness of the modules include digital literacy tests, critical thinking skills observation sheets, and student and teacher perception questionnaires. The data obtained will be analyzed quantitatively and qualitatively to provide a comprehensive picture of the impact of the use of the teaching module.

Through this study, it is hoped that an empirical picture can be obtained about the influence of digital citizenship learning on increasing students' understanding of digital technology and information, as well as their ability to think critically about the various content they encounter. Furthermore, the results of this research are expected to be a reference for teachers in developing learning methods that are adaptive to the dynamics of the times, especially in equipping students with digital literacy and critical thinking competencies (Kusumasari et al., 2024).

With the right learning, elementary school students can be prepared to become digital citizens who are able to maintain safety and ethics in using technology, as well as have a critical attitude in dealing with complex and ever-changing information. In addition, digital citizenship-based learning can be a medium to shape students' character to be more concerned about their digital environment, able to collaborate online, and contribute positively to the digital community (Supriatna & Sari, 2023).

The role of teachers as facilitators in this learning process is very important. Teachers not only act as conveyors of information, but also as companions who foster students' critical awareness and moral responsibility in the digital world.

It is also important to involve parents in supporting digital citizenship learning (Dewi et al., 2021). With synergy between school and family, the values taught in the teaching module can be strengthened and applied consistently outside the school environment. Thus, the development of digital citizenship teaching modules is not only a technical need in education, but also part of a strategic movement to form a digitally literate and critical generation in facing the challenges of the information age.

Basic education is the foundation for the formation of students' character and skills. Therefore, it is important for educational institutions to take an active role in preparing students to face the complex and dynamic digital world. This research also contributes to the development of educational science, especially in the development of thematic learning models that harmoniously integrate technology, character, and high-level thinking skills (Amaliah, 2023). It is hoped that the results of the development and implementation of this module can become a national reference in developing curriculum policies and learning strategies based on the real needs of students in the digital era (et al., 2022). With the digital citizenship teaching module, schools can take concrete steps in building students' digital literacy comprehensively, while fostering critical thinking skills as a provision for their future (Setiono & Amaliyah, 2024).

2. LITERATURE REVIEW
2.1 Digital Literacy

Digital literacy has become one of the important competencies of the 21st century that must be possessed by students at all levels of education. According to Ng (2022), digital literacy does not only include technical abilities using digital devices, but also includes cognitive and social-emotional aspects of navigating digital information critically and ethically. In the context of basic education, digital literacy must be systematically instilled to form a generation that is capable of facing the complexities of the ever-evolving digital world. As exposure to digital information increases, critical thinking skills are becoming an integral part of digital literacy. Leahy & Dolan (2023) emphasize that digital literacy needs to involve a deep understanding of information, including the ability

to evaluate the reliability and validity of digital content. This is especially important considering the large amount of biased, hoax, or even harmful content spread on the internet. Thus, digital literacy is not only about access, but also about the ability to manage and assess information critically.

In its implementation, digital literacy education requires a pedagogical approach that is contextual and based on students' real experiences. According to research by Falloon (2023), the use of project-based and collaborative teaching modules can help elementary school students develop a deeper understanding of digital literacy, including in aspects of digital security, media use ethics, and digital footprints. Modules designed with active and reflective integration of digital content show an increase in student engagement and high-level thinking abilities.

Digital literacy also contributes to the formation of students' digital identities from an early age. Kim & Lee (2023) revealed that the development of digital literacy can help students understand their role as responsible digital citizens. This literacy is the basis for students to participate ethically, productively, and safely in the digital space. Therefore, it is important for educators to not only teach technical skills, but also instill responsible and sustainable digital citizenship values.

2.2 Critical thinking

Critical thinking is one of the essential skills in 21st century learning. These skills include the ability to analyze information, evaluate arguments, solve problems rationally, and make logical decisions. Ennis (2022) emphasizes that critical thinking is not only a cognitive skill, but also includes a disposition to think openly, skeptically in a healthy way, and reflectively. In the context of basic education, these skills need to be developed early on to prepare students for complex and dynamic global challenges.

Recent research by Abrami et al. (2023) shows that an explicit learning approach that integrates critical thinking strategies directly in teaching-learning activities can significantly improve students' abilities. In experimental studies involving elementary school students, guided discussion-based approaches and problem solving have been shown to be effective in fostering students' analytical and evaluative skills of the information they receive. This shows that critical thinking is not an ability that arises automatically, but needs to be trained systematically.

Advances in digital technology bring a new dimension to the development of critical thinking. According to Domínguez et al. (2023), students' exposure to various digital sources of information requires them to not only understand the content, but also evaluate the validity and intent behind the information. This is where the role of critical thinking skills becomes crucial, especially in preventing the spread of hoaxes, misinformation, and media manipulation. Therefore, the integration of digital literacy with the strengthening of critical thinking is a very relevant strategy in the digital era.

Furthermore, education that focuses on the development of critical thinking also has a positive impact on students' metacognitive abilities. According to a study by Zohar & Barzilai (2023), students who are trained in critical thinking tend to have a higher awareness of their own thought processes, which contributes to an improvement in the overall quality of learning. This indicates that critical thinking is not only a skill for completing academic tasks, but also an important foundation for lifelong learning.

It is also important to create a learning environment that supports the growth of critical thinking. As explained by Facione & Gittens (2022), teachers need to design learning experiences that are challenging yet safe, encouraging students to express opinions, ask critical questions, and investigate a variety of perspectives. Cooperative learning approaches, open inquiry, and the use of case studies are effective methods in building a culture of critical thinking in the classroom, including at the elementary school level.

3. RESEARCH METHODS

This study uses a quantitative approach with a quasi-experiment design, which aims to determine the effect of the use of Digital Citizenship teaching modules on improving

digital literacy and critical thinking skills of elementary school students (Rajah & Efendi, 2023). The experimental design used is Nonequivalent Control Group Design, which is a design that involves two groups (experimental class and control class) that are not randomly selected (Azizah, 2021).

The experimental group was given treatment in the form of learning using the Digital Citizenship teaching module, while the control group followed conventional learning without using the module. Both groups were given a pretest before treatment and a posttest after treatment to measure the improvement of digital literacy and critical thinking.

Population and Sample

The population in this study is all grade V students of Cideng 07 State Elementary School Central Jakarta in the 2024/2025 school year. The sampling technique uses purposive sampling by considering the similarity of characteristics between the experimental class and the control class. The sample taken consisted of two classes, each totaling 30 students: one class as an experimental class and one class as a control class.

1. Digital Literacy Test

This instrument is in the form of multiple choice as many as 25 questions which include indicators of the ability to search, evaluate, understand, and use digital information appropriately and ethically.

2. Critical Thinking Ability Test

This test consists of 5 case study-based description questions that measure students' ability to analyze, interpret, evaluate, and infer information logically. Both instruments have been tested for validity and reliability before being used in the study.

Data Collection Techniques

Data was collected through the following four techniques:

1. Pretest Conducted before treatment is given to determine students' initial abilities in terms of digital literacy and critical thinking.

2. Post test Conducted after treatment to determine the effect of the use of teaching modules on students' abilities.

3. Observation Used to monitor learning activities and student engagement during the learning process, especially in the experimental classroom.

4. Documentation to complete supporting data such as syllabus, lesson plans, and student work during learning.

Data Analysis Techniques

The data obtained from the pretest and posttest were analyzed using descriptive and inferential statistics. The data analysis steps include:

1. Normality and Homogeneity Test. To ensure that the data meets parametric statistical assumptions.

2. Paired Sample t-Test. It is used to find out the difference between pretest and posttest scores in one group.

3. Independent Sample t-Test. Used to find out the difference in results between the experimental group and the control group after treatment.

4. RESULTS AND DISCUSSION

The results of this study are presented based on the analysis of pretest and posttest data from two groups, namely the experimental class using the Digital Citizenship teaching module and the control class using conventional learning. The focus of measurement includes two aspects, namely digital literacy, and critical thinking skills of elementary school students.

4.1 Digital Literacy Pretest and Posttest Result

a. Experimental Class

The digital literacy pretest score in the experimental class showed an average of 59.23 with a standard deviation of 6.41. After being given treatment in the form of learning using the Digital Citizenship teaching module, the posttest score increased to 82.47 with a standard deviation of 5.87. The results of the paired sample t-test showed a significance value (p) of 0.000 < 0.05, which means that there is a significant difference between the pretest and posttest scores. This shows that learning using the Digital Citizenship teaching module has a significant effect on improving students' digital literacy.

b. Control Class

In the control class, the pretest score had an average of 58.77 with a standard deviation of 7.02, and the posttest score was 66.90 with a standard deviation of 6.88. The paired sample t-test also showed a significance value of 0.001 < 0.05, which means that there is an improvement, but not as large as in the experimental class.

c. Comparison Between Groups

The results of the independent sample t-test on the digital literacy posttest value showed a significance value of 0.000 < 0.05, which means that there was a significant difference between the experimental class and the control class. Thus, the Digital Citizenship teaching module has proven to be effective in improving students' digital literacy.

4.2 Pretest and Posttest Results of Critical Thinking Ability

a. Experimental Class

In critical thinking skills, the students' pretest scores in the experimental class had an average of 55.10 with a standard deviation of 5.94. After being given treatment, the average posttest score increased to 80.33 with a standard deviation of 6.05. The paired sample t-test showed a significance value of 0.000 < 0.05, indicating a significant increase in students' critical thinking skills after learning using the teaching module.

b. Control Class

The pretest value of critical thinking ability in the control class was 54.47 with a standard deviation of 6.33, and increased in the posttest to 65.20 with a standard deviation of 6.12. Despite the increase, statistical tests show that this increase is significantly lower than in the experimental class.

c. Intergroup Comparison

The results of the independent sample t-test on the posttest value of critical thinking ability showed a significance value of 0.000 < 0.05. This means that there is a significant difference between the critical thinking skills of students in the experimental class and the control class after treatment.

4.3 Observation and Documentation Results

Based on the results of observations during the learning process, students in the experimental class showed enthusiasm and active involvement in discussions, case studies, and digital problem-solving. They appear to be more critical in responding to information and more ethically aware of the use of the internet and social media. Documentation of student work, such as mini-project assignments and digital reflections, reinforces the findings that teaching modules have a positive impact not only in the cognitive domain, but also in the development of students' digital attitudes and behaviors.

4.4 Summary of Results

Table 1.

Aspects	Experiment Class (Posttest)	Control Class (Posttest)	Significant Differences
Digital Literacy	82,47	66,90	Ya (p < 0,05)
Critical Thinking	80,33	65,20	Ya (p < 0,05)

(Source: Data Processing Result, 2025)

4.5 Important Findings

a. The Digital Citizenship teaching module has proven to be effective in significantly increasing the digital literacy of elementary school students compared to conventional learning.
b. Modules are also effective in improving critical thinking skills, especially through problem-based activities and digital discussions.
c. Learning with modules provides a more active, contextual, and real-life oriented learning experience for students in the digital age.

Based on the results of the study, the use of the Digital Citizenship teaching module has been proven to be effective in improving digital literacy and critical thinking skills of elementary school students (Satria et al., 2025). This increase was significantly seen from the results of the comparison of pretest and posttest scores between the experimental class and the control class. These findings support the hypothesis that learning approaches that are relevant to today's digital context can have a positive influence on students' cognitive abilities and attitudes (Inggriyani et al., 2020). Digital literacy is an important skill in the era of information technology. The Digital Citizenship teaching module used in this study is designed to develop students' understanding of the safe, ethical, and responsible use of digital technology (Wahyudi et al., 2022). The material in the module covers topics such as privacy protection, cybersecurity, social media ethics, and how to evaluate information on the internet (Dwitasari Teteki & Irfi Maslachatul Ummah, 2022).

The increase in digital literacy scores in the experimental class showed that the module was able to provide a contextual and applicative learning experience. This is in accordance with Gilster's opinion (1997), which states that digital literacy is not only the ability to use digital devices, but also the ability to think critically about digital information (Oktafiyana et al., 2024). This module provides exercises that encourage students to not only understand information, but also to criticize and use digital information wisely (Rukmiati, 2022). The learning process involving group discussions, technology-based project assignments, and cyber case studies helps build students' awareness of the digital challenges they face on a daily basis. This shows that a module-based learning approach that integrates real context has a significant impact on students' digital literacy (Patmawati Patmawati et al., 2023).

Critical thinking skills are indispensable in the 21st century learning process. In this study, a significant increase in the critical thinking scores of students in the experimental class indicates that the Digital Citizenship teaching module not only enriches digital knowledge, but also encourages students to analyze, evaluate, and infer information logically (Rizki, 2024). The material in the module is designed to encourage students to think deeply about the phenomena that occur in their digital environment, such as the spread of hoaxes, cyberbullying, and the ethics of commenting on social media. Learning activities that emphasize open discussion, assessment of digital content, and evidence-based reasoning provide space for students to practice high-level thinking skills (Betaubun et al., 2023).

This is in line with Vygotsky's theory of constructivism, which emphasizes that social interaction in the context of learning is essential for developing cognitive abilities (Kusnadi, 2023). When students engage in group discussions about digital issues, they not only absorb information, but also construct new understandings based on different perspectives (Shefira et al., 2024). The control class that used the conventional learning approach still showed an improvement in the aspects of digital literacy and critical thinking, but the increase was not comparable to the experimental class (Saputri, 2020). This shows that conventional learning is not yet fully able to accommodate the needs of students in facing the challenges of the digital era. The lack of involvement of students in reflective, exploratory, and contextual activities is one of the factors that reduce the

effectiveness of the approach (Caesar Januar et al., 2022)

CONCLUSION

Based on the results of data analysis and discussions that have been carried out, it can be concluded that several important things are as follows: 1) the use of the Digital Citizenship teaching module has proven to be effective in improving the digital literacy of elementary school students; this is shown by a significant increase in the posttest scores of digital literacy students in the experimental class compared to the control class; teaching modules designed with a contextual and technology-based approach provide a more meaningful learning experience and suit the needs of students in the digital era; 2) students' critical thinking skills have also experienced a significant improvement through the use of this teaching module; learning activities that encourage analysis, reflection, and evaluation of actual digital issues make students more active in assessing information and making rational decisions; the problem-based learning approach and critical discussion have been proven to be able to hone high-level thinking skills in elementary school-age children; 3) learning using the Digital Citizenship module creates a more participatory, reflective, and collaborative learning environment; students are more involved in the learning process, show an active attitude, and are able to apply digital knowledge in their daily lives more responsibly; 4) comparisons between the experimental class and the control class showed that the module-based innovative learning approach was superior to the conventional approach; while the control class showed a non-significant increase, the experimental class showed a noticeable spike in both digital literacy and critical thinking aspects; 5) overall, the Digital Citizenship teaching module can be used as an alternative learning media that is relevant, adaptive, and contextual to support 21st century learning; this module not only improves students' cognitive competence, but also instills character and ethical values in the digital world, which is crucial for the future of the younger generation.

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