



# A Literature Review On The Role Of Coding Learning In Developing Elementary Student's Digital Literacy

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## Abstract

Coding is a way of giving the government a computer device, application, or website to do something. Coding learning is carried out in elementary schools to train digital skills in critical thinking, creativity, and problem solving for students in the current digital era. This writing method uses a qualitative approach with Systematic Literature Review. The data were analyzed thematically to identify core digital literacy indicators related to coding practices. The purpose of writing this article is to find out how coding learning affects the improvement of digital literacy skills of elementary school students. The results of the study found that there are 10 national journals indexed by Sinta that review coding learning for digital literacy skills obtained from the Publish or Perish database on Google Scholar sources. Therefore, in today's digital era, coding learning is important to be applied and integrated in learning in elementary schools.

## 1. Introduction

The advancement of digital technology has brought changes in various aspects of life, including in the world of education. The *era of Society 5.0* demands changes in the learning system, individuals not only become users of technology but also able to understand and create technology itself (Hariyasasti, 2025). Therefore, at the elementary school level, coding learning began to be implemented as an effort to improve students' skills that can help them compete in the current digital era developments. Thus, learning to code is a basic skill that needs to be taught from an early age so that students can be better prepared to face future challenges.

The application of coding learning in Indonesia has a strong foundation, both from legal aspects and educational theory. Constitutionally, no one has yet made or explained it directly. However, article 31 paragraph (3) of the 1945 Constitution of the Republic of Indonesia explains that the government must strive and explain a national education system in order to increase faith, piety, and noble morals. In this context, the introduction of coding is part of the educational curriculum in line with efforts to educate the nation's life through mastery of technology. According to Law Number 20 of 2003 explains the National Education System which emphasizes the importance of curriculum development according to the development of science and technology. This is strengthened by the Regulation of the Minister of Education, Culture, Research, and Technology Number 8 of 2024 concerning Content Standards at the PAUD, Primary Education, and Secondary Education levels, which mandates the integration of 21st century skills, including digital literacy and coding into the educational curriculum.

Learning coding in elementary school is not only a provision for students' skills in programming, but also the development of students' skills in understanding technology. According to Woo & Falloon, 2022 several studies show that coding learning has a contribution to increasing *creativity*, *problem solving*, and *critical thinking* of elementary school students. The aspect of *problem solving* is a skill in coding learning that is relevant in the digital era. *Problem solving* trains students to be able to identify problems, analyze errors, and find effective solutions in digital systems. In addition, learning coding also provides opportunities for students to explore logical thinking more deeply so that they are able to contribute to analytical skills. The next cognitive development is the ability to *think critically* in understanding and assessing digital information.

Coding teaches students to test code and find errors systematically. This process helps students in evaluating the credibility of information in the digital world as well as building the mindset needed in the current information era (Delacruz, 2020). Learning Coding helps students to understand logical thinking structures that can make it easier to analyze and formulate solutions to various problems. Good

students' critical thinking skills will be able to sort out information correctly from unreliable sources. It helps students to be able to think logically in order to understand each cause-and-effect relationship. Coding provides an understanding to compile systematic and efficient instructions in completing a task. According to Mutoharoh et al., 2023, logical thinking developed through coding can be applied to students' use of technology, such as the way of decision-making in the digital world. Changes in learning with coding can equip educators to have an understanding of technological skills. Therefore, learning coding is used as a means of improving students' skills in the development of the current digital era, so that students are not only passive users of technology, but also active creators.

The application of coding learning at the elementary school level seeks to improve skills relevant to the digital era. According to Muklason et al., 2023, shows that the introduction of programming for elementary school children can become a new literacy in the *era of Society 5.0*. Through learning coding, students are also trained to be able to think creatively. Students are able to think creatively if they can develop innovative solutions to every problem and are able to take responsibility for each of these solutions. Therefore, the application of coding learning at the elementary school level not only improves technical skills but also students' literacy skills related to technology. According to research by (Istiqomah & Fanny Novika, 2024), states that the importance of coding-based learning integration to provide curriculum strength in the digital era.

In the context of elementary school education, learning to code can provide benefits to various cognitive aspects. In addition to improving digital comprehension competencies, coding learning also plays a role in developing the logic skills and thinking patterns of elementary school students (Suhendar et al., 2021). Learning to code can be done through a variety of methods, such as block-based programming that is easier for elementary school students to understand. With the availability of applications and supporting software, students become motivated to learn exploration independently so that learning becomes more effective and fun.

Digital literacy is a 21st century competency that elementary school students must have in facing a technology-based world. (Long-term and short-term impacts) Learning coding is considered one of the effective strategies to improve elementary school students' understanding of technology such as symbols (Zaidiah et al., 2024). Learning to code is not just learning about using technology, but understanding how technology works and developing technology innovatively. This research also discusses how coding learning can improve elementary school students' understanding of technology and how coding skills can be applied in daily life. Digital literacy is not only the ability to use technological devices, but also includes a critical understanding of digital information as well as skills in creating new technologies (Awaluddin, A., & Hadi, 2025). The purpose of this study is to analyze the role of coding learning in improving the digital literacy competencies of elementary school students. By understanding these roles, it is hoped that it can provide insight for educators and policymakers in designing effective learning strategies. This study also aims to identify the factors that affect the effectiveness of coding learning in improving digital literacy. In addition, the results of this research are expected to be the basis for the development of training programs for teachers in integrating coding in the elementary school curriculum.

Coding not only trains skills in programming, but also develops *problem-solving*, critical thinking, logical thinking, and creative skills. However, specific literature reviews focusing on how coding contributes to elementary students' digital literacy development are still limited. Coding learning in elementary school has not been widely applied and understood, especially in its implementation and benefits for students. The implementation of coding learning in elementary schools is still not carried out optimally due to the limitations of technological infrastructure, lack of coding training for educators, and lack of coding integration in the curriculum. Several studies show that coding learning has an impact on the level of technology understanding of elementary school students, so the formulation of the problem in this study is how coding learning can contribute to the digital literacy skills of elementary school students.

This research is expected to contribute to improving the technological skills of elementary school students through coding learning. Therefore, students can have relevant readiness and skills to face the challenges of the digital era in the future. In addition, this research is also expected to be able to encourage future researchers to conduct further research on the integration of technology in basic education. In addition, this research is also expected to be able to encourage future researchers to conduct further research on the integration of technology in basic education.

## Literature Review

### Coding and Computational Thinking (CT)

“Coding” is an attempt to teach computational language and “Computation Thinking (CT)” refers to the thinking process involved in providing Solutions as a computational step or algorithm that can be performed by a computer (Rich et al., 2021). Coding and Computation Thinking (CT) include several categories of sub-skills that develop a framework by identifying 3 main dimensions of CT, namely, computational concepts, computational practices, and computational perspectives.

Computational concepts are concepts used by programmers for sequences, loops, parallelism, events, conditionals, operators, and data. Computational practices are practices developed by programmers and are incremental and iterative, testing and debugging, reusing and remixing, and abstracting and modularizing. Computational perspectives are perspectives developed by programmers, such as identifying as creators, valuing collaboration, and “asking questions about and with technology”.

### Coding and Digital Literacy Competencies

Coding/programming skills are the ability to write a series of commands for a computer to solve a particular problem. In the 21st century, the integration of coding in learning is needed to improve digital literacy, which is not only the ability to acquire technical skills, but the entire educational process that includes the entire digital environment consisting of users, machines, tools, applications, technology, and data.

Digital literacy is also defined as the ability to understand, analyze, and use information in various forms from various sources (Zeeshan et al., 2024). To achieve the level of digital literacy skills, there is a set of skills or cognitive competencies that must be developed, namely, critical thinking, problem-solving skills, computational thinking, idea creation, collaboration, and communication.

### Challenges in Coding Implementation at the Elementary Level

The main challenge in implementing coding in elementary schools is the limited competence of teachers who do not have a background in computer science, making it difficult to convey programming material to students. In addition, the infrastructure and technological resources in schools are inadequate, especially in remote areas. According to (Kurniawati & Hanafi, 2023), the distribution of technological facilities causes a gap in access and quality of technology-based learning, one of which is coding.

The important role of parental perception and support also has an impact on the implementation of coding learning. Parents still have concerns about the negative impacts of using digital devices, so collaboration between schools and parents is important to improve coding learning in elementary schools. The integration of coding in learning in elementary schools has also not been adjusted to the national curriculum and the availability of materials that are appropriate to students' cognitive levels.

## 2. Method

This study uses the SLR (Systematic Literature Review) qualitative method. This research is conducted to collect, identify, review, record, assess, and manage information and findings from research articles that have been published and indexed by Sinta. The source in this study is the Sinta-indexed national journal which reviews coding learning in elementary schools. Inclusion criteria included journal articles published 2020–2025 focusing on elementary coding and digital literacy. Articles were filtered by relevance, full-text access, and national indexing. Researchers use electronic databases, Publish or Perish and Google Scholar to search and collect relevant articles. The selection of staples is carried out based on the assessment of the quality criteria of the source of the material. These criteria include the national journal Sinta, the year of publication of the article in the range 2020 – 2025, not the book chapter, and the subject discussed is coding learning in elementary school educational institutions. Schematic of the criteria for staples in Table 1. as follows:

**Table 1. Staple Ingredient Criteria Scheme**

No.	Criterion	Qualify	
		Yes	Not
1.	Is Sinta indexed journal?		
2.	What is the year of publication of the article in 2020 – 2025?		
3.	Is the writing not a <i>book chapter manuscript</i> ?		
4.	Is the subject of the study an elementary school educational institution?		

### 3. Results and Discussion

#### 3.1 Learning Coding in Elementary School

Learning coding in elementary school has become an important topic in education today. Coding is not only a programming and language, but coding is also a way to develop various skills, especially in digital skills. Currently, at the elementary school level, coding learning has been implemented and integrated in an extracurricular that is carried out by students outside of their learning hours. Coding is a basic literacy in the digital era, so it needs to be learned in order to be able to understand the technology that exists around. Learning to code can help students to have digital skills with good communication, creativity, and increase confidence (Muklason et al., 2023). According to Suhendro et al., (2022), it is explained that coding learning in elementary school is carried out in several stages, namely the first is the preparation stage, which is the stage of preparing coding learning materials, including basic coding introduction material, getting to know more about symbols, and simple exercises to develop skills.

The training stage is carried out through offline meetings with each student listening to material directions from the teacher in using a device. Students are given assignments and projects related to coding with direction from the teacher in providing instructions for the use of symbols/icons. Learning to code ends with an evaluation through recalling or open-ended questions. The existence of learning in elementary schools can train the critical and creative thinking of elementary school students which is their provision in technological advancement. Coding/programming for elementary school children should be integrated with the real world of their lives. Coding learning activities in elementary schools use games by involving concrete objects that are able to attract students' attention and interest. Learning to code is also supported by tools used in programming, such as stationery, computers/laptops, mice, modules, keyboards, and worksheets. Coding learning is able to develop digital skills with problem-solving and social skills of elementary school students. Therefore, coding learning in elementary school is very important to be applied from an early age, especially at the elementary school level to provide the development of digital skills, critical thinking, and *creativity* (Rizal, 2024).

#### 3.2 The Impact of Coding Learning on Digital Literacy

The development of coding learning carried out in elementary schools today certainly has an impact on students' skills. One of these developing skills is digital literacy. So what is the impact of coding learning on the digital literacy skills of elementary school students? The researcher has conducted a literature review study by identifying 13 articles relevant to the article title. These articles were further analyzed and identified as many as 10 articles that discussed coding learning for the digital literacy skills of elementary school students. The article selection strategy can be seen in Table 2. As follows:

**Table 2. Article Selection Strategy**

No.	Discussion Categories	Search Engines	Search Results
1.	Sinta-indexed journals	<i>Publish or Perish and Google Scholar</i>	20
2.	Year-of-issue 2020 - 2025		16
3.	Not a <i>book chapter manuscript</i>		14
4.	The subject of the research is elementary school education		10
Results discussed			10

The selected articles are articles that are in accordance with the categorization of provisions by the researcher, which focuses on the findings of the impact of coding learning on digital literacy skills. Ten articles that have been selected according to the categorization are then presented in the form of Table 3. The following are the results of the analysis of relevant articles related to coding learning on digital literacy skills in elementary schools:

**Table 3. The Impact of Coding Learning on Digital Literacy**

Article	Method	Findings	Solution
Research			
Programming Training Using Applvmentor in Elementary Schools as Digital Literacy in the Industrial Era 4.0. (Rizal, 2024)	Community service activities	Based on the results of programming training activities using MIT <i>App Inventor</i> at SDN Cadaskertajaya II, it shows a significant increase in improving students' digital literacy skills towards the development of gadget-based applications through hands-on practice by providing an interesting and easy-to-understand learning experience as well as a visual-based learning approach and hands-on practice.	The article uses a practical approach and introduces basic programming concepts visually and intuitively to elementary school learners with the aim of improving their digital literacy.
Coding Kids as a step to develop digital literacy for early childhood. (Suhendro et al., 2022)	Qualitative with descriptive analysis	The article shows that the implementation of the <i>Coding Kids</i> program in early childhood has been proven to be able to have a positive impact on the development of digital literacy comprehensively through three stages, namely preparation, training, and evaluation. The program not only uses technological devices, but also develops critical thinking skills, imagination, and creativity through a fun and contextual approach to learning.	This article argues that the implementation of the program is structured in the form of extracurricular activities that include stages of preparation, training, and evaluation with a play-while learning approach that is in accordance with the characteristics of child development. Using <i>unplugged coding</i> methods and concrete tools.
Introduction of Coding in the Context of Improving Digital Literacy for M.I. Jami'atul Khair Ciledug Tangerang Students. (Adrezo et al., 2023)	Participatory methods	The article shows that the introduction of animation-based coding is very effective in increasing students' interest and digital understanding of programming concepts that reflect an improvement in logical, systematic, and creative thinking skills. Visual-interactive learning methods such as Scratch can be an effective means of instilling a digital mindset from an early age.	The article uses the introduction of animation-based coding as an interactive learning medium through the visual <i>drag and drop method</i> . The implementation of the activity is designed in a participatory manner, involving students in a simple game-making project.
The Effect of Improving Computational Thinking in Grade 5 Students through Basic Coding Learning. (Mufidah, T. H., & Majid, 2024)	Quantitative methods	The article uses a <i>Computational Thinking</i> approach by using the Scratch platform to impact digital literacy with learning engagement and motivation. Improvement of systematic, collaborative thinking skills, and initial understanding of programming concepts. The high enthusiasm of students is able to improve the ability to think systematically, collaboratively, and have an initial understanding of programming concepts.	The article uses the application of coding learning based on <i>the Computational Thinking</i> approach which is able to provide an interactive and enjoyable learning experience and instill cognitive skills (decomposition, pattern recognition, abstraction, and algorithms contextually). The integration of <i>Game-Based Learning</i> is able to improve collaboration and communication between students.
Introduction of Educational Games as Digital Learning Culture in Elementary School Learning. (Jayanti et al., 2021)	Qualitative with rual opperaisal	Based on the service at SD Negeri Plosorejo 2, it shows that educational games through <i>the platform code.org</i> succeeded in creating high enthusiasm in students for learning informatics, as well as strengthening digital literacy within the framework of <i>digital learning culture</i> . This learning is able to foster	The article argues that with the integration of web-based educational games, especially <i>code.org</i> platform is able to introduce the basic concepts of algorithms and programming through the visual-block programming method which is used as a fun

		a basic understanding of algorithms and programming in a fun and contextual way.	and interactive learning tool to encourage the gradual development of digital thinking skills.
The Utilization of Scratch Platform in Coding Learning in Elementary Schools to hone Computational Thinking skills in Students. (Wulandari et al., 2021)	Qualitative descriptive with analytical methods	The article shows that the use of <i>the Scratch</i> platform significantly contributes to the development of the digital skills of elementary school students. Through Scratch, critical thinking skills, precision, and sensitivity to visual elements are also developed. Programming activities through Scratch train students to solve problems systematically and logically, as well as improve intelligence in the context of creation.	The article uses utilizing the visual programming platform <i>Scratch</i> to improve the digital proficiency of elementary school students. <i>Scratch</i> is used to construct algorithms and solve problems logically through <i>drag-and-drop</i> techniques against the provided blocks of code, making it easier to understand the literacy of programming concepts without the need to memorize complex syntax.
Coding for Kids: Introduction to Programming for Elementary School Children as the New Digital Literacy in Industry 4.0. (Muklason et al., 2023)	Surveys and interviews	Based on service activities at MI Nasyrul Ulum 1 Grobogan, it was shown that basic programming training using <i>Code.org</i> , <i>Scratch</i> , and <i>App Inventor</i> platforms had a positive impact on students in getting to know the basic concepts of coding as part of digital literacy. This programming is fun, easy to understand, and useful and it looks more child-friendly and easier to operate.	The article uses basic programming training based on educational platforms to foster digital literacy to elementary school students. The activity begins with training materials that are tailored to the cognitive level of children and is attractively packaged through an interactive visual interface that allows students to learn in a fun way with the aim of forming a digital mindset from an early age, including logical, analytical, and creative thinking skills.
Animation of Maze Game with Scratch Junior as Programming Learning for Elementary School Students of Hamidah Sampurna School, Bandung Regency. (Purnamasari, R., Budiman, G. Saleh, K., Dimarta, C.R., Parameswara, 2024)	Community service activities	The article shows that learning programming through <i>maze game</i> animation with <i>Scratch Junior</i> can be an effective means of strengthening digital literacy in elementary school students. In this context, coding activities are carried out for digital skills, problem-solving, and self-expression independently through creative projects. Learning to code is an interesting and inclusive pedagogical approach to improve digital skills from an early age.	Articles using programming through <i>the Scratch Junior</i> app. The approach is for students to learn basic programming concepts through interactive and fun activities, such as creating game <i>maze</i> animations, so that they are also digital content creators. Through digital learning, students are introduced to programming logic, simple algorithms, and mindsets that are part of today's digital literacy, thus encouraging the creation of a learning ecosystem that supports the mastery of technology skills from an early age.
Scratch as Problem Solving Computational Thinking in the Prototype Curriculum. (Rozady, M. P., & Koten, 2021)	Systematic Literature Review	The article shows that the use of <i>Scratch</i> can strengthen students' digital literacy. <i>Scratch</i> actively teaches students to develop interactive projects such as animations and simple games to foster an understanding of algorithmic concepts, logical thinking, and systematic problem-solving. This activity is very much in line with the project-based learning approach carried out by the Prototype Curriculum, which emphasizes character development and soft skills.	The article applies the integration of <i>computational thinking</i> to the Prototype curriculum through the use of <i>Scratch</i> applications as a visual-based coding learning medium. Project-based emphasizing learning creates simple animations, games, and simulations. The use of <i>Scratch</i> in students is able to practice systematic, creative, and collaborative thinking in dealing with contextual problems.
Scratch Coding for Kids: An Effort to Introduce Mathematical Thinking and Computational	Community service activities	The article shows that the use of <i>Scratch Coding for Kids</i> can provide students with hands-on experience to practice creating animations and	The article uses <i>the Scratch Coding for Kids</i> application as an interactive and fun visual learning medium. The

Thinking to Elementary School Students. (Zahir et al., 2021)

educational games visually, thereby improving current digital literacy in the development of logic, critical thinking, creative, and problem-solving skills. The integration of *computational thinking materials* in learning is able to strengthen learning disciplines that are relevant to strengthening digital literacy.

program is designed in the form of integrated student training that includes hands-on practice of creating simple animations and games based on basic logic and algorithms. Students are introduced to the programming structure that can be used as digital literacy today.

Based on the results of the literature review, coding as part of technology-based learning shows a significant contribution to the development of digital literacy skills in elementary school students. This is supported by the findings of various studies that observe the practice of implementing coding in the context of elementary education. A study by (Woo & Falloon, 2022) shows that creative coding activities can help students improve their critical thinking, problem-solving, and collaboration skills. Creatively designed coding projects provide space for students to design digital solutions, think algorithmically, and work together to complete simple programming tasks. In the context of digital literacy, this learning strengthens students' understanding of digital interactions, creativity in technology-based problem solving, and develops computational thinking as the foundation for 21st-century digital thinking. Meanwhile, a study by Zahir et al., (2021) which examined the use of Scratch in mathematics learning showed that the platform not only improves students' mathematical logic but also strengthens basic programming skills. Scratch provides an intuitive and child-friendly visual environment, allowing students to develop simple algorithms while playing. This activity directly contributes to the formation of logical literacy and systematic thinking skills which are part of the basic digital competencies that are very important at the elementary school level.

Both studies emphasize that digital literacy is not only related to the ability to use digital devices, but also includes aspects of logical thinking, digital creativity, online collaboration, and data-based decision-making. Coding provides a rich ecosystem to develop all of these aspects in an integrated manner. Therefore, integrating coding into the elementary school curriculum can be an important strategy to prepare a generation that is not only technologically literate, but also capable of managing and creating digital content productively and responsibly. However, to ensure its effectiveness, the implementation of coding must be supported by teacher training, the availability of devices and networks, and the development of coding modules that are contextual and appropriate to the level of students' cognitive development.

Coding is a very important skill to master from an early age. Learning to code is a way for students to learn to understand why and how technology is around them (Muklason et al., 2023). Learning to code not only teaches students how to use technology, but also helps train students for *critical thinking, creativity, and problem solving*. Coding learning in elementary school is applied to learning from basic programming materials. Therefore, the current digital era of elementary schools is able to integrate coding learning in learning or extracurricular activities.

### 3.3 Conclusion

Based on the results of the literature review, it can be concluded that coding learning in elementary school has a significant impact on improving the digital literacy skills of elementary school students. Various studies show that learning coding not only develops technical skills in understanding the basics of programming, but also hone digital skills in critical thinking, creative, logical, and problem-solving which are integral parts of digital literacy. Through the use of *Scratch, App Inventor, and Code.org*, introducing the picker pattern, the structure of logic visually and contextually, so that it is able to understand and create technology-based solutions. Therefore, in today's digital era, coding learning can be applied and integrated in learning in elementary schools. The next research is expected to be able to analyze in more detail in accordance with the context of coding learning on the digital literacy skills of elementary school students. Future studies should explore the integration of coding across subjects and develop localized coding curriculum adapted to primary school context.

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