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The Role of the Deep Learning Approach in Developing Digital Literacy and Character in Elementary Schools

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Abstract. Elementary school students are among the largest users of digital devices who are vulnerable to digital crime threats. The use of digital platforms by elementary school students must be accompanied by the development of digital literacy skills and the instillation of strong character, so that they do not become victims or perpetrators of digital violations. This research aims to examine the role of the deep learning approach in developing digital literacy and character skills in elementary schools. This study uses qualitative research with observation, interview, and questionnaire techniques involving 30 phase C students and teachers at one of the public elementary schools in Lembang District, West Bandung Regency. The findings in this study indicate that the teacher has implemented deep learning principles that emphasize students' learning experiences as mindful, meaningful, and joyful. The deep learning approach can indirectly encourage students to independently acquire information and develop their digital literacy skills. Deep learning education can also encourage students to develop various knowledge they acquire into a way of life. The deep learning approach plays an important role in creating learning situations that can develop students' digital literacy and character.

Keywords: deep learning, digital literacy, student character

INTRODUCTION

The development of the world today has entered the era of society 5.0, which demands the role of education in preparing a generation that is of high quality and possesses good character in navigating a rapidly evolving life. In this era, the rapid development of technology and digitalization permeates various aspects of life (Sugiarto & Farid, 2023). The presence of various digital platforms will have a positive impact on the ease of access to information and communication (Dewi, 2022). However, the presence of various digital platforms can also trigger threats in the form of digital crimes such as hoaxes, access to inappropriate content, fraud, data theft, and cyberbullying (Utaminingsih et al., 2023; Haryanto et al., 2022). Education plays an important role in preparing a generation with the skills to face various threats of digital crime.

The skills to use digital platforms to avoid various risks of digital crime are part of digital literacy skills (Utaminingsih et al., 2023). Digital literacy can be defined as an individual's ability to effectively and efficiently utilize digital technology to facilitate their interests (Hsu, Wenting, & Hughes, 2019). Digital literacy is closely related to digital devices. Yasa & Rahayu (2023) state that digital literacy is the ability to operate and create digital devices, manage received information, and the ability to actively participate in social networks. Digital literacy can also be defined as an individual's capacity to acquire, evaluate, organize, and perform activities using digital platforms and the internet in educational, professional, and social contexts

(Wijayanti, Dwiningrum, & Saptono, 2024). It can be concluded that digital literacy is the ability to maximize the potential of digital devices to facilitate one's needs. Someone who masters digital literacy is one who can use digital devices to their fullest potential and is accompanied by a character full of responsibility in their usage.

The ability of digital literacy will always correlate with character development. In line with that, Purnama et al., (2021) state that children with low digital literacy skills tend to exhibit negative self-control behavior, making them potential suspects or victims of cybercrime. To build a generation capable of facing the rapid development of technology and digitalization, serious efforts are needed to equip students with digital literacy skills and good character.

Literacy skills, which also include digital literacy, play an important role in achieving educational success (Trianto & Heryani, 2021). Digital literacy is a basic skill that everyone must possess in utilizing digital technology (Purnama et al., 2021). Digital literacy skills are one of the abilities that should be developed and mastered by students starting from elementary school (Dewi, 2022). In line with that, Sugiarto & Farid, (2023) state that digital literacy skills accompanied by character formation and development should already be integrated into learning. Elementary school students should already possess good skills in using digital devices effectively and efficiently, have good abilities in selecting and sorting information obtained from digital media, and have begun to develop a sense of responsibility in using digital devices. With the possession of digital literacy skills from the elementary school level, it is hoped that students can be protected from various threats of digital media (Wijayanti et al., 2024).

The percentage of internet and digital platform users aged 5-12 years (elementary school age) is 12.27% of all internet users in Indonesia (BPS, 2023). The magnitude of this figure could pose a threat in terms of the misuse of digital devices and the internet by elementary school students, considering that elementary school students tend to have relatively low levels of digital literacy (Ningsih, Widodo, & Asrin, 2021). Bareskrim POLRI recorded a very significant increase in the level of digital crime from 612 incidents in 2021 to 8,831 incidents in 2022 (Pusiknas Bareskrim Polri, 2023). Indonesia also briefly ranked 2nd in the world as the country with the highest level of digital crime in the world (Komdigi, 2020). Santika (2024) states that students are the largest group of digital users who are targeted by digital attacks in Indonesia.

The issue of threats from the use of digital devices is not only a problem at the national level but has also become an international problem. The latest report from The Global Cybersecurity Forum (GCF) identifies that 72% of children worldwide have experienced at least one type of

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cyber threat (Davies, 2022). The National Crime Agency, which is the national law enforcement agency in the United Kingdom, also revealed that 20% of children aged 10-16 years were involved in behavior that violated the Computer Misuse Act (National Crime Agency, 2024). The data underscores the urgency of strengthening digital literacy and character education starting from elementary school.

In the process of developing digital literacy at the elementary school level, a learning approach is needed that can provide a learning experience capable of creating a deep understanding for students. The Ministry of Primary and Secondary Education has introduced the concept of the Deep Learning approach, which consists of three elements: mindful learning, meaningful learning, and joyful learning (Kemdikbud, 2025). Mindful learning means learning with full awareness, focusing on the learning process, and paying attention to thoughts and emotions while learning. Meaningful learning is related to connecting learning materials with real life, as well as finding relevance and purpose in learning. Meanwhile, joyful learning is the concept of learning with joy, creating a pleasant learning atmosphere, motivating students, and encouraging curiosity. The deep learning approach focuses on the importance of active student interaction and the use of technology to support a more personal and applicable learning process (Akmal, Maelasari, Ilmu, & Islam, 2025). The deep learning approach is one of the learning approaches expected to provide a deep understanding of digital literacy to elementary school students. Through a concept of learning that is full of awareness, full of meaning, and enjoyable learning, it is hoped that elementary school students can more easily develop their character and digital literacy skills.

Based on the research background, the researcher is interested in conducting a study with the theme "The Role of the Deep Learning Approach in Developing Digital Literacy and Character in Elementary Schools." This research aims to examine the role of the deep learning approach in enhancing digital literacy skills and character development among elementary school students.

METHODOLOGY

The research approach used in this study is a qualitative approach. The qualitative approach was chosen with the aim of deeply analyzing the role of deep learning in enhancing the digital

literacy and character of elementary school students in Lembang District, West Bandung Regency. This research uses a qualitative research design proposed by Creswell, which consists of the following stages: problem identification, literature review, determination of research objectives, data collection, data analysis and interpretation, and reporting of results (Creswell, 2009). Figure 1 shows an overview of the stages of qualitative research according to (Creswell, 2009).

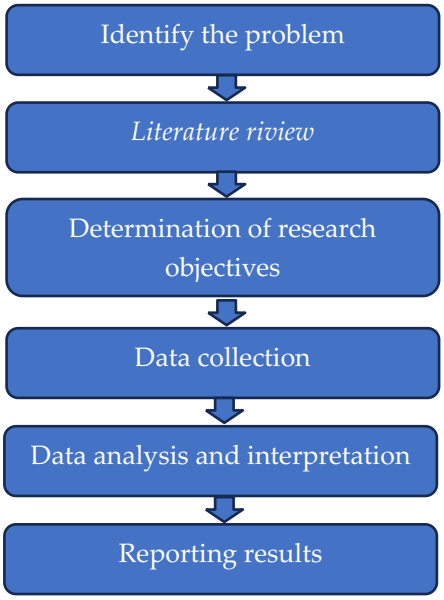

Figure 1. Stages of qualitative research according to Creswell (2009)

The research subjects in this study are phase C students of a public elementary school located in Lembang District, West Bandung Regency. The sampling technique in this study uses purposive sampling. The purposive sampling technique was chosen based on recommendations from teachers who teach at the school where this research is conducted. From the results of the sampling process, 30 students were selected as subjects to assess their digital literacy and character, and to examine the relationship with learning using a deep learning approach.

The data collection techniques used in this research include interviews, observations, and questionnaires. Interviews were conducted with teachers to identify whether they have applied the principles of deep learning in their teaching. Observation is conducted to see how the learning process unfolds and to observe the students' behavior during the learning process. Questionnaires were given to students to see their digital literacy skills and character in using

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digital devices. In addition to examining students' digital literacy skills and their character in using digital devices, the questionnaire was also used to verify the findings from interviews and observations. The questionnaire given to students was developed based on 5 aspects of digital literacy capability indicators according to (Ferrari, Punie, & Redecker, 2012), which consist of: information management and collaboration, communication and sharing, content creation and knowledge of ethics and responsibility, evaluation and problem-solving, and technical operations.

The data analysis techniques used in this research refer to the concepts proposed by (Miles & Huberman, A, 1994), which consist of: data collection, data reduction, data presentation, and conclusion drawing. This data analysis is conducted to gain a deep understanding of the role of the deep learning approach in the development of digital literacy and character of elementary school students.

RESULTS AND DISCUSSION

Based on the observation results, it appears that the teaching conducted by the teacher has implemented aspects of the deep learning approach. The learning process has demonstrated meaningful learning by encouraging students to construct their new knowledge by linking it with relevant conceptual knowledge and knowledge they already possess. The learning process has also demonstrated a mindful learning experience characterized by openness and the stimulation of students' curiosity, grounded in the spirit of love, a conscious learning process, and open pedagogical dialogue. The entire learning process implemented is packaged in the form of enjoyable learning activities for students, which also shows that the learning has applied the principle of joyful learning.

This research identifies a positive relationship between learning using a deep learning approach and students' digital literacy and character. The easy access students have to digital devices allows them to use these devices as a medium for learning and expanding their knowledge. Teachers often use digital devices to support the learning process. The results of the questionnaire given to 30 students indicate that the majority of students have good skills in using digital devices. Based on the results of the observations conducted, in classes with deep learning instruction, the character aspects of the students also fall into the good category. Most students have demonstrated aspects of independence in learning, cooperation and collaboration, responsibility, as well as good ethics and compliance. In addition, based on the interview results, it was also found that students are better able to appreciate their friends and can assess any deviations in the use of digital devices by their peers.

Learning Using Digital Platforms to Improve Digital Literacy

The results of the observations and interviews indicate that teachers often use various digital media such as Quizziz, Wordwall, Google Forms, Canva, and PowerPoint to create an enjoyable learning process for students. Learning using digital technology devices will encourage student enthusiasm and create an enjoyable learning atmosphere (Purwati & Antari, 2022; Mansur et al., 2024). The findings in this study also indicate that learning using various media in digital form can create an enjoyable learning experience and introduce students to various platforms they can use for studying.

In addition to being able to create an enjoyable learning atmosphere for students, the use of digital platforms in education also provides knowledge and experience on how to use various platforms that can be utilized to assist learning activities. Students can utilize various platforms introduced by teachers to assist them in completing the assigned tasks (Ditzler et al., 2016 ; Helal, 2025). Based on the findings from the questionnaires filled out by the students, it shows that the majority of students have been able to use various applications to create images, videos, or writings on their computers or smartphones. Students are also capable of operating various applications such as Canva, Microsoft Word, and PowerPoint to assist in completing school assignments. This shows that there is a positive influence from the aspect of joyful learning through the use of digital devices in education to enhance students' digital literacy.

The Role of Deep Learning in Developing Students' Abilities to Obtain Information from Digital Devices

Deep learning that emphasizes a learning experience that is conscious, meaningful, and enjoyable will encourage students to delve deeper into the knowledge they acquire in class independently. The availability of internet access makes it easier for students to obtain information related to a knowledge concept (Kolikant, 2010; Jeffres et al., 2012). The ease of access to knowledge will make it easier for students to further study the concepts of knowledge they have acquired.

Data obtained through the questionnaire indicates that the majority of students have adequate skills to search for information on the internet and save it as a learning resource. Most students also have the ability to distinguish between true and false information by checking the sources of the information they obtain through the internet. That ability is very important amidst the abundance of false information (Keersmaecker & Roets, 2017). The deep learning educational

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approach can train students to use the internet as a source of information to acquire new knowledge from reliable sources.

The Role of Deep Learning in Developing Students' Digital Communication Skills

The implementation of the deep learning approach will create opportunities for student communication and collaboration in the learning process (Gufron & Suryahadikusumah, 2024). Data obtained through the questionnaire indicate that the majority of students have good communication skills using various platforms such as WhatsApp, email, and Google Meet. Students have also developed an awareness of using proper language in digital communication and always consider before sending messages or comments on digital devices. This is something that students must master because it is an important part of digital ethics (Fitra, Aprilliya, & Lidinillah, 2022).

In addition to communication, students have also developed good skills in collaborating through digital devices. The survey results indicate that the majority of students have the ability to use various digital tools such as Google Docs to collaborate with their peers. The emergence of various digital communication and collaboration platforms enables the creation of digital discussion and collaboration spaces (Snow, Fjeldstad, & Langer, 2017). This allows students to collaborate to collectively explore new knowledge about a concept.

The Role of Deep Learning as Control Over Digital Device Usage

The use of digital devices and the internet without proper control can lead to addiction and dependence among students (Sakamoto, Kabaya, & Nakayama, 2022). Addiction and dependence on the internet and digital devices can make students vulnerable to various mental and physical health issues (Kurniasanti, Assandi, Ismail, Nasrun, & Wiguna, 2019).. To avoid the risk of addiction and dependence of students on digital devices and the internet, control measures in the form of prevention and early diagnosis are necessary (Malak, Khalifeh, & Shuhaiber, 2017). It is important for teachers to make concrete efforts in preventing and diagnosing students who are addicted to the internet and digital devices.

Based on the interview results, one of the efforts made by the teacher to control excessive and irresponsible use of digital devices is by using a good habits book. When asked about the efforts made to control students' excessive use of digital devices, the teacher responded, "Students are asked to record their daily activities, including the use of gadgets or digital devices. They are required to report how long they use digital devices, what content they access, and what digital activities they engage in". This can certainly serve as a control to

ensure that students do not use digital devices excessively and to ensure they access good content. With continuous control, it is hoped that students can use various digital devices according to their needs (Malak et al., 2017). The control over students' use of digital devices is one form of pedagogical dialogue between teachers and students, which is one of the indicators of mindful learning.

The Role of Deep Learning in Increasing Awareness of Digital Breaches

Knowledge and sensitivity of students towards various types of digital abuse and violations are important to master (Elsharkawy, Baraka, & Baraka, 2023). Case studies at the beginning of the lesson by discussing various phenomena related to the misuse of digital devices are one of the efforts made by teachers to build sensitivity towards digital violations. In this case, students can learn with full meaningfulness by observing various phenomena of misuse and violations of digital ethics and building knowledge about how one should use digital devices.

Sensitivity to forms of digital violations will encourage students to have knowledge about digital ethics (Terttiaavini & Saputra, 2022). Based on the interview results, it was found that students have been able to evaluate and take action when encountering an ethical violation in the use of digital devices. Students have developed sensitivity when their friends send inappropriate messages and report them to the teacher. This shows that meaningful learning plays an important role in increasing students' sensitivity to violations of digital ethics.

The Role of Deep Learning in Enhancing Digital Security Protection Capabilities and Digital Problem-Solving Solutions

Knowledge about digital security plays an important role in ensuring the safety of data and digital devices can function properly (Ali & Jali, 2018). An explanation of various security threat phenomena and digital obstacles that teachers encounter can trigger a mindful learning process about the importance of digital security protection and efforts to solve digital problems. Based on data obtained from the questionnaire, it shows that the majority of students have realized the importance of virus protection, avoiding suspicious websites or messages, not sharing personal information with others on the internet, and using passwords that are difficult for others to guess. In addition, deep learning education also encourages students to independently find various information related to how to solve various problems on digital devices.

The Role of Deep Learning in Student Character Development

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The deep learning approach is an approach that plays an important role in shaping students' character as learners (Anwar, 2017). Based on the observation results, 70% of students have good learning initiative, 64% fall into the good category in terms of cooperation and collaboration, 70% have good responsibility character, 83% of students fall into the good category in terms of ethics and compliance, and 83% fall into the good category in terms of emotional management and self-resilience. The data shows a relationship between the deep learning instruction conducted by the teacher and the achievement of student character.

The rapid development of digital technology demands serious efforts to equip students with strong character (Kulsum & Muhid, 2022). Learning with a deep learning approach encourages students to develop various knowledge they acquire in their studies into a living character, including character in using digital devices. A person's character will be reflected in the form of ethical values that are inherent to them (Annisa, Wiliah, & Rahmawati, 2020). The findings from the questionnaire given to the students indicate that the majority of the students have demonstrated good digital character. The data obtained shows that 90% of students are aware of copyright regulations; they know that they should not use or take someone's pictures or writings without permission. In addition, 73% of students have recognized the importance of ethics regarding the use of polite language when using digital devices. This shows that the deep learning conducted has encouraged the achievement of students' character and digital ethics.

The Role of Each Deep Learning Principle in Facilitating Students' Digital Literacy Skills and Character Development

The principles of Deep Learning, which include mindful, meaningful, and joyful learning simultaneously, facilitate the development of Digital Literacy and character in students through conscious, relevant, and enjoyable learning. Mindful learning fosters full awareness of technology use so that students are able to manage information critically, understand digital ethics, and build character traits such as responsibility, self-control, and empathy when interacting in the digital space. Meaningful learning connects learning activities with real-life experiences, making digital skills such as information analysis, online collaboration, and technology-based problem solving more meaningful and encouraging the formation of integrity, cooperation, and social responsibility. Meanwhile, joyful learning creates a positive and motivating learning atmosphere, encouraging students to explore creatively with technology so that character traits such as creativity, perseverance, and a positive attitude towards learning develop alongside the mastery of digital competencies. These three

principles work complementarily in shaping students who are not only digitally literate, but also ethical, reflective, and have strong character in facing the challenges of the digital era.

CONCLUSION

This research provides an overview that the deep learning approach plays an important role in efforts to enhance the digital literacy and character of elementary school students. Based on the findings from interviews and observations, it was found that teachers have implemented various principles of deep learning that emphasize mindful, meaningful, and joyful learning experiences. Interview and observation findings also indicate that students have good character in terms of learning initiative, cooperation and collaboration, responsibility, ethics and compliance, as well as good emotional management and resilience. Survey findings indicate that the majority of students have the ability to use digital devices and possess good digital ethics.

The use of the deep learning approach, if done well, will create a learning atmosphere that can encourage the development of digital literacy and student character. However, the limitations in skills and facilities to design learning with a deep learning approach, as well as the limited control that teachers can exert while students are at home, often become obstacles in the process of instilling digital literacy and character in students. Therefore, it is important for teachers to continuously seek information on how to conduct learning with a deep learning approach and to establish good communication with students' parents.

The results of this study recommend the use of a deep learning approach as a learning method to enhance the digital literacy and character skills of elementary school students. With deep learning education, it is hoped that students will be able to develop the knowledge they acquire in class to enhance their digital literacy and character. Research on the deep learning approach still has room for development in future studies, particularly in the development of other basic literacies such as literacy in reading and writing, numeracy literacy, science literacy, financial literacy, as well as cultural and civic literacy. This research is expected to contribute as a foundation for implementing the deep learning approach in order to enhance the digital literacy and character skills of elementary school students.

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