Conceptual Article

Artificial intelligence literacy teaching in social studies education

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The increasing role of artificial intelligence (AI) in daily life has led to the emergence of numerous skill sets associated with AI. AI literacy, which is becoming an important citizenship competence, has become a skill that has gained importance in recent years. It is thought that the aim of social studies to prepare students as active citizens of today and the future has made AI literacy a direct subject of social studies education. However, the literature on the relationship between social studies and AI literacy is still scarce. This study aims to explore the relationship between social studies and AI literacy and to discuss the potential role of social studies in teaching AI literacy. In this direction, the concept of AI is defined, and the teaching of AI literacy in education is examined; the teaching of this literacy within the scope of social studies is discussed, and an example of a hands-on activity-supported lesson plan, which can be used in social studies classes, is presented. This study is important in terms of pointing out the potential role of social studies in AI literacy teaching.

Keywords: Artificial intelligence literacy; Chatbots; Hands-on activities; Social studies

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1. Introduction

Digital technologies enriched with artificial intelligence (AI) have caused significant changes in daily life by deeply affecting society's thinking, acting, and interacting processes (Chen et al., 2020). While Yang (2022) emphasize that AI-assisted technologies are becoming more prominent in modern society, Southgate (2019) pointed out that these technologies have become an integral part of our daily lives. It is not possible to develop a single definition of the concept of AI (Wang, 2019). According to Chen et al. (2020), there are two reasons for this. The first is that AI shows a dynamic and ever-changing structure. The second reason is that AI is an interdisciplinary field. Researchers and experts from many different areas such as neuroscience, psychology, and linguistics constantly include their own perceptions, knowledge, and terminology in this field, which makes it challenging to suggest a general definition (Chen et al., 2020). When the literature is examined, it is seen that there are different definitions of AI. According to John McCarthy, who first coined the term, AI is the science and engineering of making intelligent machines, especially intelligent computer programs (McCarthy, 2004). While Copeland (2022) defines AI simply as the ability of

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computers or computer-assisted systems to perform tasks associated with intelligent entities, Kaplan and Haenlein (2019) define AI as a system's ability to correctly interpret external data, learn from these data, and adapt these learnings flexibly to achieve specific goals and tasks.

AI can be classified in three ways: narrow, general, and super AI (Southgate et al., 2018). Narrow AI is the only form of AI humanity has yet achieved. In this form of AI, also called weak AI, the technology operates around a limited context and cannot undertake tasks beyond its own. Natural language processing, image and voice recognition, suggestion and prediction systems, and even self-driving car technology are considered within the narrow scope of AI; however, this does not mean that narrow AI is inefficient. These systems successfully perform routine physical and cognitive tasks that are difficult for humans to do. General AI, also called strong AI, refers to the ability of machine intelligence to rival human intelligence and make complex decisions by thinking at the human level, having perceptions, making connections between irrelevant thoughts, and creating authentic memories that affect subsequent decisions. In super AI, the last of the classifications, machine intelligence surpasses human intelligence in almost every field and can perform tasks beyond human capacity. Today, however, going beyond narrow AI is considered a distant target by the academic community (Dickson, 2017; Leahy et al., 2019). The evaluation of Yang et al. (2021, p. 4) on this issue is as follows:

> When AI technologies can make better decisions than humans or better know individuals than they know themselves, then what is left for humans do? AI has indeed far surpassed human capabilities in computing and decision-making. However, humans have some characteristics that AI cannot match. These characteristics are their abilities regarding perception, emotion, feeling, and cognition. Although AI algorithms have evolved to imitate human behavior, these human characteristics are still difficult to imitate in a short time.

Despite these limitations, AI plays a vital role in improving human life. Hartwig (2023) stated that AI will create new opportunities for people by increasing information output and productivity and increase the efficiency of businesses by supporting people in the economy and reducing human-induced errors; he also emphasized that by taking on the solution of complex problems that people face and the fulfillment of tedious tasks, AI will give them more time to learn, experiment, and explore, and ultimately will improve people's creativity and quality of life. A 2019 report by the Organisation for Economic Cooperation and Development (OECD) highlighted the opportunities presented by AI in numerous fields, including transportation, agriculture, finance, marketing, advertising, science, health, justice, and security. AI reshapes economies and increases the quality of life by allowing people to predict the future more qualifiedly and make more informed decisions (OECD, 2019).

The rise of AI in all areas of social life has led to the emergence of various skill sets associated with AI. One of the skill sets that has recently drawn significant attention in the literature refers to AI literacy. AI literacy, which defines the ability of individuals to use AI technologies effectively and ethically, has started to stand out as an important citizenship competence in recent years. Thus, the purpose of social studies to prepare students as active citizens of today and the future is making AI literacy a critical element of social studies education. However, the literature on the relationship between social studies and AI literacy is still scarce. The study presented aims to explore the relationship between social studies and AI literacy and to discuss the potential role of social studies in teaching AI literacy. In what follows, AI literacy and its application in the social studies classroom will be discussed, and examples of the use of AI will be presented.

2. Teaching About AI: Social Studies and AI Literacy

Today, AI applications affect almost all fields of activity, especially industry, banking, insurance, health, and defense sectors (Ganascia, 2018). One of the fields in which AI technologies are widely used is education. Studies in this field have led to the emergence of AI in education, and there has been an increasing interest in this field, especially in the last 10 years (Chaipidech et al., 2022).

Mertala et al. (2022) divide the use of AI in education into "teaching with AI" and "teaching about AI." Accordingly, while teaching with AI adopts AI as a tool for education, teaching about

AI approaches AI as the essence of education and a learning goal. There is a growing global trend toward teaching AI at the K-12 level (Sanusi et al., 2022). Today, China, the United Kingdom, Thailand, Korea, and the European Union are taking important steps to standardize what students should learn in the context of AI education. Various organizations also establish criteria for teaching AI to students in grades K-12. Examples of these initiatives include those by the Association for the Advancement of AI (AAAI) and the Computer Science Teachers Association (CSTA) to establish national guidelines for teaching AI to K-12 students (Su et al., 2022) and the Taiwan Ministry of Education's "AI teaching & AI education: The overall education strategy of AI and emerging technology," which promotes AI education from primary school to university (Hsu et al., 2021).

One of the essential initiatives in this regard was carried out by the International Society for Technology in Education (ISTE), founded in the US in 1979. According to the ISTE (2022), "To prepare students for the careers of today—and tomorrow—educators must explore and integrate AI (AI) into K-12 classrooms"; furthermore, "Educators are the key to preparing students to thrive in a world where AI is an integral part of their lives and careers." The ISTE published a guide series called "Hands-On AI Projects for the Classroom" that aims to provide primary, secondary, elective, and computer science teachers with innovative curricular resources on AI across various grade levels and subject areas. Each guide provides basic information about what AI is, how it works, and how it impacts society while providing background information and four student-focused projects directly related to subject area standards. Through these hands-on projects, students work directly with innovative AI technologies, participate in "unplugged" activities, and complete projects ranging from designing chatbots to presentations and video games to demonstrate what they have learned (ISTE, 2022).

AI teaching is traditionally carried out at the university level, but in recent years, there has been increasing interest in teaching AI at the K-12 level (Steinbauer et al., 2021). AI education, a relatively new concept for the K-12 level, has begun to be seen as an important subject that should be continued from early childhood to high school (Ayanwale, 2022). According to Yang (2022), AI education should be started from early childhood for three reasons. First, knowing and understanding the basic functions of AI and using AI applications is an organic part of digital literacy for all citizens. Second, children need to be empowered to understand, use, and evaluate AI. Third, despite the various concerns that exist, children have the ability to understand the basic functions of AI, and it is possible to give children an understanding of AI through age-appropriate activities. On the other hand, discussions on this subject generally continue over the concept of AI literacy.

AI literacy, which can be seen as a sub-type of digital literacy, has emerged as a new skill set in response to the increasing role of AI in people's daily lives (Yang, 2022). AI literacy is the set of competencies required to use AI technologies effectively and ethically in daily life (Ng et al., 2022); that is, "Knowing and understanding the basic functions of AI and how to use AI applications ethically in everyday life" (Yang, 2022, p. 2). AI literacy, which has become an important competency for everyone (Su et al., 2023) aims to give people new abilities and ways to participate in digital society (Kong, Cheung, & Zhang, 2021). According to Ng et al. (2021), AI literacy has four different aspects: knowing and understanding AI, using AI, evaluating and creating AI, and AI ethics. On the other hand, AI literacy does not require people to master the basic theories and developments related to AI. Accordingly, if people can use AI tools competently and reasonably, they can be seen as AI literate (Wang et al., 2022). According to Kong et al. (2022), there are two main benefits to teaching AI literacy at the K-12 level. First, students are given an understanding of AI at a younger age. Second, students can discover their interest in AI early and be inspired to adopt AI in their studies and careers. Thus, they can not only be users of AI but also shape it as creators.

In recent years, the importance of AI literacy in order for individuals to adapt to social life has been widely discussed. Indeed, a critical challenge in education today is enabling younger

generations to adapt to a world in which AI is widely used (Carvalho et al., 2022). AI learning opportunities can empower students by providing them with the knowledge and skills they need to thrive in today's world, which is increasingly shaped by AI (Southworth et al., 2023). Solid knowledge of AI principles and concepts, the ability to understand and use AI tools, techniques, and methods, and the ability to analyze and identify the long-term benefits and social and ethical aspects of AI have become essential skills for the 21st century (Steinbauer et al., 2021). Students should know how to use AI technologies and learn to distinguish between ethical and unethical practices (Ng et al., 2021). Citizens should use AI appropriately while successfully protecting their interests and privacy (Kong et al., 2021). In addition, the rapid expansion of AI technologies among different fields and industries has made it necessary to develop a workforce with the knowledge and ability to work with AI (Lee et al., 2021). Today, many business and government leaders say that promoting AI literacy is vital to ensuring every citizen's personal success and general regional well-being (Kong et al., 2021). To join the age of AI productively, all young people need to gain a basic understanding of how AI works and how it will affect their lives (Lee & Perret, 2022).

It may be argued that the aim of social studies to prepare students to be active members of society now and in the future has made AI literacy a direct subject of social studies education. Indeed, social studies has an essential role in equipping young individuals with the knowledge, skills, and values necessary to ensure their active participation in society. Preparing students for a changing world, developing their perspective and understanding of the society and world they live in, and providing them with the knowledge, skills, and abilities they will need in their lives are among the main goals of social studies (Dynneson & Gross, 1995). In this sense, social studies can play an important role in children's awareness of the AI-surrounded state of the world they live in and raising them as citizens who know how to use AI effectively. In addition, AI literacy teaching activities carried out in social studies can be helpful in terms of making students discover their interest in AI technologies from an early age and encouraging them to work with these technologies in their future careers. Southworth et al. (2023) stated that learning about AI can provide students with insight into new career paths. They also pointed out that as AI becomes more and more prevalent in the business world, those who can understand and work with AI technologies will have distinct advantages over those with less developed AI skills. Therefore, AI teaching activities in social studies can be beneficial in increasing the competitiveness of the students who will work in the business areas that require specific AI skills.

The interdisciplinary structure of social studies and its nature embellished with life-related topics makes it suitable for teaching this literacy. In this context, this literacy can be taught under different learning domains of social studies, especially "individual and society," "science, technology, and society," and "active citizenship." Within these learning domains, students can develop an understanding of the place and importance of AI technologies in today's world and their potential future. They can understand the basic working principles of AI technologies used in daily life and learn to use them effectively and ethically. Students can benefit from the usability of AI technologies, and they can develop an understanding of AI by using these technologies themselves. In fact, employing applied experiences in AI education is a practical approach for children to learn AI concepts (Williams et al., 2019). In addition, it is vital to develop learning activities supported by age-appropriate AI tools to strengthen children's understanding of AI (Yang, 2022). Social studies teachers can benefit from simple AI-supported technologies such as navigation and translation applications, various suggestion systems, image and voice recognition, and chatbots in their hands-on AI teaching activities. A lesson plan with a hands-on activity that can be used to teach AI literacy in social studies education is presented in the following section.

2.1. Hands-on Activity-Supported Lesson Plan

Social studies educators can benefit from the power of different AI technologies in teaching AI literacy. One of these technologies—chatbots—can be used as an effective tool in teaching AI literacy, which is likely to become an important citizenship skill within the scope of social studies. According to a simplified definition, chatbots are computer programs designed to simulate human

speech through text or voice interactions (Brush & Scardina, n.d.). The primary purpose of chatbots is to simulate intelligent human speech; thus, the person can experience a realistic chat process. In the literature, various names are given to chatbots, such as AI assistant, smart virtual assistant, digital assistant, speech agent, and virtual agent (Surendran et al., 2020). The easy use and understandable structure of chatbots suggest that this technology can be used as an effective tool in teaching AI literacy in social studies classes. In this direction, a chatbot-supported lesson plan developed by the researchers in accordance with the social studies curriculum implemented in Türkiye (MoNE, 2018) is presented below.

Table 1
Hands-on activity-supported lesson plan

First Chapter	
Subject	Social studies
Grade level	6th Grade
Learning domain	Science, Technology, and Society
Outcome	SB.6.4.2. They propose ideas about the effects of scientific and technological developments on future life.
Time	Four lesson hours (40+40+40+40)
Second Chapter	**LEARNING-TEACHING ACTIVITIES**
Methods and techniques	Lecture, question-answer, brainstorming, cooperative learning
Educational technologies used: Tools, materials, bibliography	Smart board, tablets, chatbots
Values and skills	Responsibility, cooperation, communication
Attention	The teacher writes "Artificial intelligence" on the board and states that this will be the concept that will guide the lesson.
Motivation	The teacher tells the students that at the end of the process, they will gain a basic understanding of the concept of AI and will have an idea about its present and future effects on their lives.
Review	The teacher states that they will talk about the concept of AI and learn about AI technologies used in everyday life. İn addition, the teacher says that they will benefit from AI-powered chatbots in this process, and they will perform a cooperative learning activity.
Transition to the lesson	The teacher asks students what comes to mind when they think of AI and asks them to express their thoughts in a few words.

Lesson Development Process

Exploring preliminary ideas on the concept of AI

The answers given by the students are written on the board. The teacher encourages students to think about this concept and share their ideas. The teacher writes the students' ideas on the board and makes a general evaluation of the ideas put forward by the students. The similarities and differences between the ideas expressed by the students are evaluated with class participation.

Addressing AI and its social effects

After the related activity, the teacher states that AI is the ability of computers or computer-aided systems to perform tasks associated with intelligent beings. Afterward, it is noted that AI is divided into narrow, general, and super AI. After specifying the basic features of these types, it is emphasized that we are currently in the narrow AI period. In this context, examples of narrow AI technologies used in fields such as health, education, transportation, and commerce are given. AI technologies such as navigation applications, digital assistants such as Siri and Alexa, self-driving car technology, and suggestion systems integrated into various websites are mentioned. The potential impacts of these technologies in our present and future are highlighted, and the ever-evolving nature of AI is emphasized. The teacher states that AI technologies are everywhere, that students should be aware of this, and that they must prepare themselves for a future surrounded by AI technologies. At this point, the teacher chooses an AI technology and states that they will work on AI through this technology. This technology will be a "chatbot."

Table 1 continued

Introduction of chatbot technology

First, chatbot technology is defined and the main purposes of chatbots are detailed. Famous chatbots such as A.L.I.C.E., Eliza, Mitsiku, and personal assistants such as Siri, Google Assistant, and Alexa, which can be seen as more advanced versions of chatbots, are mentioned. The widespread use of chatbots in areas such as banking, e-commerce industry, and customer service is expressed. The working principles of chatbots are discussed. It is stated that chatbot conversations take place in two domains, open and closed. It is emphasized that conversations in the open domain do not require any limitations, similar to human conversations, but that conversations in the closed domain develops around a limited number of predetermined topics within the framework of a specific target. It is also mentioned that chatbots can be completely AI-based, button-based, or a hybrid combining the two.

It is stated that chatbots are retrieval and generative according to the response generation mechanism. It is stated that chatbots do not create any new text in the retrieval model but make sense of the input from the user and select the appropriate response from the repository, whereas generative models produce new responses from scratch. The role of natural language processing technology in these processes is detailed. Concepts such as domain, generative/retrieval, natural language processing, and extract are emphasized in all these processes.

Experience with chatbots

It is stated to the students that they will communicate with two different chatbots in groups and compare these experiences. In this context, students are presented with two different chatbot examples. The first is "Kirima," which is closed-domain and retrieval-based in response generation and combines AI and button-based systems. The other is "ChatGPT," an open-domain generative chatbot based entirely on AI. Here, students are expected to communicate with these chatbots, test their current capacity, and evaluate their experiences by considering the working principles of chatbot technology. The class is divided into groups of four. Each group is given a tablet. All groups enter https://www.chatbotlaogren.com/, which hosts four closed-domain retrieval chatbots consisting of a combination of AI and button-based systems. Here, students are asked to choose Kirima, one of three chatbots in human form that provides information about polar climate and conducts question and answer activities. Students are given time to chat with Kirima. A sample chat stream of Kirima is presented below.
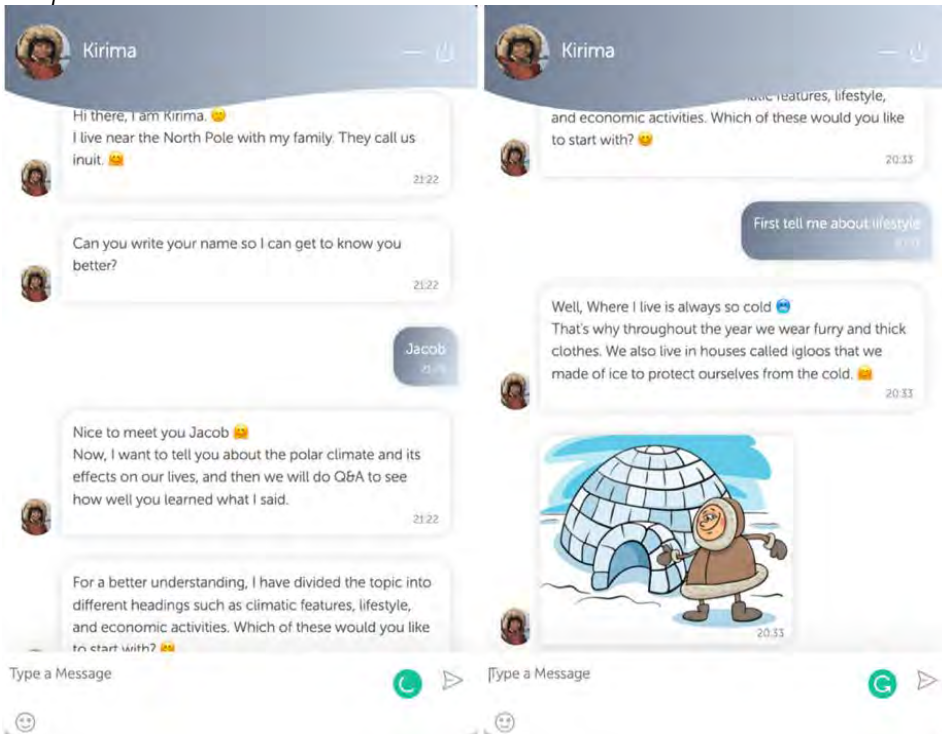
Picture 1

Chat homepage of Kirima

Table 1 continued

Picture 2
Sample chat stream with Kirima

After the students complete the relevant chat experience, the teacher states that this time they will chat with ChatGPT, an open-domain generative chatbot based entirely on AI. All students contact ChatGPT via https://chat.openai.com/. Here, the teacher asks them to chat with ChatGPT about the polar climate. A fictional chat stream with ChatGPT is presented below.

Picture 3
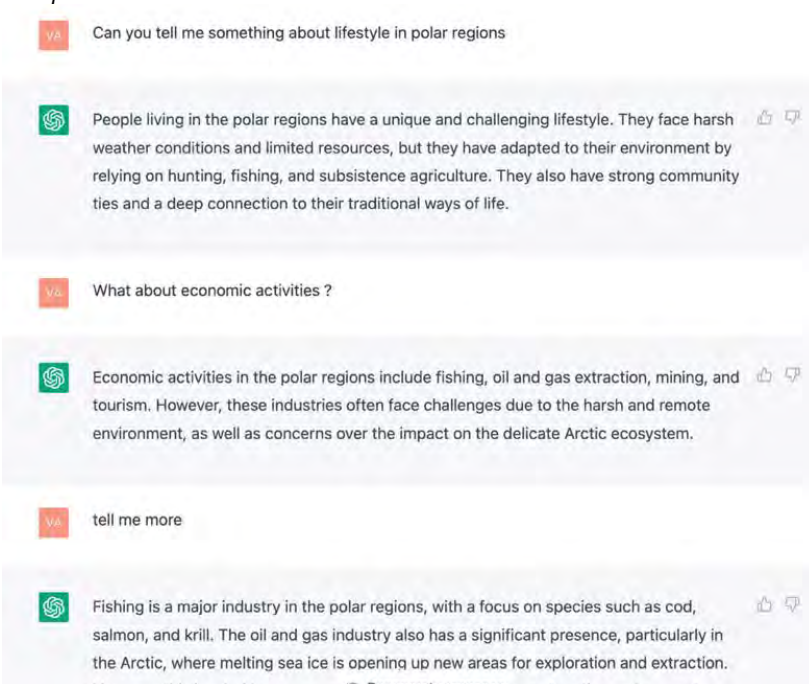*Sample chat stream with ChatGPT*

Table 1 continued

Evaluation of chatbot technology
After the students' chat experience, the groups are asked to compare both chatbots. At this stage, the evaluation form, which includes the following questions, is distributed to the group.

1) How do you evaluate the strengths and weaknesses of your chat experience with ChatGPT?

2) How do you evaluate the strengths and weaknesses of your chat experience with Kirima?

3) How do you evaluate the relationship between these strengths and weaknesses and the system features of the chatbots? (response generation, domain type)

4) How do you evaluate the relationship between these strengths and weaknesses and the AI level of the chatbots? (AI, hybrid)

Groups are given time to work on related questions. At the end of the study, the group spokespersons share the evaluation results with the class. Relevant results are evaluated with the participation of the class. The teacher makes a general assessment at the end of the process. The process is concluded by emphasizing that AI-supported chatbots are a technology that will likely gain more importance in the future.

Third Chapter	
Assessment and evaluation	The teacher divides the class into groups and organizes an intergroup quiz activity with the Kahoot application on the important topics taught in the lessons.

3. Conclusion

AI applications stand out as new and exciting technologies in today's educational environments. The impact of these technologies is not limited to the field of education but is felt in all areas of social life (Holt, 2018). While Reinhart (2018) states that 85% of Americans use at least one AI-assisted technology in their daily life, Chiu (2021) says that the influence of innovative AI applications everywhere has significant effects for the society and future generations. At this point, it is important for individuals to have an understanding of the structure of their society surrounded by AI and to grow up knowing how to use these technologies effectively and ethically. Social studies, which aims to prepare individuals as active citizens of today and the future, will play an essential role in this regard. Within the scope of social studies, hands-on activities can be designed in which students interact with AI technologies and discover their working principles and social effects. At this point, social studies teachers can direct students to interact with various AI technologies. For example, in a scenario where chatbots are used, the teacher can organize classroom learning activities that require students to use the chatbots themselves. In addition, after a short training, students can develop their chatbots through non-coding programs such as Mobilemonkey, Botsify, and MindBehind and present them in the classroom. Through these hands-on activities, students can better learn the basic working principles of chatbot technology and concepts such as natural language processing and natural language understanding specific to chatbots. Fostering hands-on experiences is an essential element in social studies education. Real time application of hand-on experiential learning activities and AI pedagogies in the social studies classroom proves critically important in improving technical skills, creativity, critical thinking, and problem-solving skills that are essential for success in AI (Southworth et al., 2023). Ng et al. (2021) stated that AI learning originally started with university-level computer science education, which is challenging for K-12 students and requires advanced programming competencies, but with the emergence of age-appropriate hardware and software such as chatbots or translation applications, young students have the chance to use AI technologies while acquiring AI literacy. At this point,

social studies teachers can benefit from these age-appropriate AI technologies while teaching AI literacy.

In conclusion, although the necessity of teaching AI to students has been widely discussed in recent years (Su, Zhong, & Ng, 2022), and bringing this literacy to individuals through education has become an important issue (Laupichler et al., 2022), attempts to promote AI literacy for citizens are inadequate (Kong, Cheung, & Zhang, 2021). In addition, awareness of the potential role of social studies in this regard is quite weak. However, considering the increasing importance of AI technologies and their possible future effects, it is possible to say that AI literacy may become an important citizenship qualification of our age. Social studies can play an important role in teaching this literacy, which is currently seen as a sub-type of digital literacy (Yang, 2022) but is likely to become an independent and important citizenship qualification in the future. At this point, it can be suggested that social studies educators conduct theoretical and applied studies that point out the relationship between AI literacy and social studies. These studies will help the development of new perspectives on the subject, revealing the potential role of social studies in teaching AI literacy and encouraging social studies educators to work on this subject.

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