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| RESEARCH ARTICLE

Enriching Social Cognitive and Behavioral intention by Mobilizing Robotics Tutor-based GenAI in Education 6.0

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| ABSTRACT
The study aims to investigate the impact of incorporating robotics-based GenAI into pedagogical approaches, in order to enrich social cognitive development in the higher education context. By examining the impact of robotics-based Generative Artificial Intelligence (GenAI) on social cognition and learning outcomes, this study investigates the application of GenAI in Indonesian higher education, specifically in sociology programs. In poor countries like Indonesia, where pedagogical and infrastructural constraints prevent its widespread adoption, the report highlights the gap in the application of GenAI in the education system. Over the course of four weeks, 27 sociology students used ChatGPT as a robot tutor for undergraduate students to access information, and the study used a mixed-methods approach to collect data through observation and structured questionnaires. Despite the students' perception of GenAI as a valuable tool for enhancing engagement, problem-solving, and comprehension of intricate sociology topics, the findings revealed no correlation between the use of ChatGPT and students' social cognition. Furthermore, it appears that classroom dynamics and teacher engagement are more important factors influencing undergraduates' social cognitive development. Future recommendations to fully incorporate GenAI into education and investigate its long-term benefits include strengthening infrastructure, addressing ethical issues, and improving teacher training.

| KEYWORDS

Social Cognitive, behavioral intention, ChatGPT, GenAI and Robotics Tutor

| ARTICLE INFORMATION

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1. Introduction

Robot tutors and other forms of generative artificial intelligence (GenAI) have the potential to revolutionize classroom teaching by making lessons more engaging and collaborative for students (Muthmainnah et al., 2024). Understanding human relationships and societal systems is essential in the discipline of sociology, where this is especially important. Robot tutors offer a robust platform for students to engage with sociology based on the social cognitive theory, which emphasizes the importance of observation and engagement in learning. These GenAI-enabled tutors can make previously intangible ideas more concrete by modelling realistic social situations, tailoring their comments to each student's unique learning style, and so on (Al Yakin et al., 2024). According to Bandura's social cognitive paradigm, which he developed in 1986, learning behavior is influenced by a combination of internal and external influences. By enabling collaborative conversations and problem-based learning (PBL), robot tutors in sociology education can help students make the transition from theoretical knowledge to practical application. For example, they provide immersive settings that mimic group dynamics and social roles, allowing students to explore topics such as inequality and identity. Furthermore, virtual robot tutors (VRT) enhance the value of peer interaction, a critical component of education, by questioning and moderating group discussions Grubišić and Crnokić (2024). Furthermore, these systems can assess students' responses instantly, offering immediate feedback on the application of sociological concepts, thereby enhancing comprehension and analytical reasoning (Baksh et al. 2024).

Tools like GenAI-powered robot tutors influence students' behavioral intentions to use them, revealing the structural relationship between social cognition and technology. Students with high performance expectations who believe the technology will enhance their learning outcomes are more likely to adopt robot tutors (Wong, 2024). Furthermore, effort expectancy is important, as the simplicity of these systems influences their adoption. Because GenAI simplifies difficult sociology concepts, students may perceive robot tutors as easy and high reward learning tools. Students are more likely to use robot tutors if they see their classmates and teachers using them well, which is an example of social influence.

There are a number of barriers that may prevent the widespread use of robot tutors despite their obvious benefits. Especially in developing regions, where hardware and reliable internet may be scarce, technological infrastructure continues to be a significant barrier. Additionally, for teachers to successfully incorporate robot tutors into their lessons, teacher training is essential. Besides that, educators need to address ethical issues, such as the potential for bias in GenAI systems, particularly in sociology classrooms where topics such as race, gender, and class are taught (Adel, 2024).

The social cognition and robot tutoring GenAI initiative is providing a new avenue for improving sociology instruction. In addition to facilitating critical thinking and group work, this resource helps students grapple with abstract social topics. However, the technological, pedagogical, and ethical hurdles associated with GenAI in the classroom must be overcome to ensure a smooth rollout (Neumann et al., 2023). This generation of AI and robot instructors will undoubtedly play an increasingly large role in the future of higher education, changing the way people learn sociology and other fields.

The use of generative artificial intelligence (GenAI) and robot tutors is a growing trend in Indonesian education, particularly at the university level. While there has been progress in incorporating technology into the classroom in Indonesia, most research has focused on more conventional forms of online education, with very little investigation into the potential of more sophisticated artificial intelligence systems such as GenAI. Given that sociology, education requires a deep understanding of human behaviour, social interactions, and societal structures, a major gap in Indonesia's educational landscape is the lack of research and practical application of AI-driven tools such as robot tutors in the learning process (Aithal and Aithal, 2024). Issues with infrastructure, inadequate teacher preparation, and a general reluctance to embrace new technologies in schools all contribute to widening this gap. Furthermore, there is a lack of a comprehensive pedagogical framework that would allow for the integration of sophisticated AI technologies into fields such as sociology, which prioritize contextual learning, social understanding, and critical thinking, despite Indonesia's strong efforts to incorporate technology into the curriculum. Educators' awareness and willingness to adopt GenAI and robot tutors are also lacking, especially when considering concerns about the ethical implications, potential bias, and technological complexity of these systems.

This study, with an emphasis on the Indonesian educational context, primarily seeks to investigate the structural relationship between social cognition and generative artificial intelligence (GenAI) through the interaction of a robot tutor application (ChatGPT) in sociology education. This study aims to explore the potential of GenAI-powered robot tutors to enhance sociology education using interactive simulations, immediate feedback, and individualized lesson plans. Furthermore, this study seeks to understand the variables, including performance expectancy, effort expectancy, social influence, and enabling situations, that influence the behavioural intentions of both instructors and students to implement GenAI-assisted instruction. This study aims to explain how Indonesian higher education can utilize robot tutors to enhance engagement with sociology concepts, critical thinking, and learning outcomes by analyzing the potential benefits and challenges of incorporating these tools into sociology education. This study also aims to provide recommendations to policymakers, educators, and institutions to bridge the infrastructural and pedagogical gaps that prevent the Indonesian education system from using advanced AI technologies. Furthermore, this study adds to the current conversation about the moral consequences of implementing AI in the classroom, especially in fields such as sociology that address sensitive social issues. This study emphasizes the importance of GenAI systems that have culturally sensitive and ethically sound algorithms to prevent the perpetuation of bias in educational settings. Finally, this study concludes with actionable recommendations for Indonesian educators and lawmakers to address the challenges of implementing AI-driven tools in the classroom, including strengthening the country's technological infrastructure, providing better teacher training, and fostering a culture of innovation in Indonesian universities.

AI is not new to the communications industry. Since the development of digital technology, AI has been widely used in various information systems. However, recently, AI in the form of ChatGPT has become popular among students because of its ability to collect information quickly. On the other hand, the development of AI has received pros and cons among experts. In the historical retrospect of AI, early public perception tended to view this technology as a complex entity that was largely inaccessible to the majority (Cockburn, Henderson, & Stern, 2018). However, over time, AI has developed rapidly and is now integrated into various aspects ofeveryday life. However, with the increase in AI capabilities, various challenges have also emerged.

There are a number of complex issues related to cultural norms and values that are difficult to measure through computation or data (Markov, 2015). As a result, AI technology faces various challenges and problems. According to several reviews from ChatGPT users, there are indications that the information provided by this system can sometimes be inaccurate and potentially ambiguous. In addition, by relying on available online data, AI carries the risk of misuse, including the threat of data leakage and the risk of digital impersonation. AI has emerged as a contemporary technological phenomenon that has received significant public attention (Ng, A., 2016). One of its implementations, ChatGPT, is recognized for its significant contribution to supporting students' academic activities. Through its sophisticated algorithms, AI has shown potential in facilitating various sectors, including medical, security, and social interaction. Although AI has the ability to approach human cognitive abilities in solving complex problems, there are ethical and normative issues that are difficult to measure through computational data. Some ChatGPT users have pointed out inaccuracies and ambiguities in the information presented. In addition, by relying on digital data, AI carries potential risks, including data leakage and impersonation.

2. Literature Review

Education 6.0 is the cutting edge of educational technology, where generative artificial intelligence (GenAI) powers collaborative learning environments where people and robots live and work side by side. Education 6.0 proposes a future where humans, robots, and artificial intelligence collaborate to improve learning experiences, tailor education to everyone, and increase access to information, in contrast to earlier versions that focused on digital literacy or integrated new technologies into the classroom. The emergence of GenAI systems, such as robot tutors and AI-powered teaching assistants, is bringing this harmony to fruition through collaborative learning settings that combine human intelligence and artificial intelligence (AI).

2.1 GenAI's Function in the Classroom 6.0 Robot-Human Cooperation: Practical Uses.

The ability of artificial intelligence to customise learning experiences for each student is the driving force behind Education 6.0, which is based on the ideals of personalisation, collaboration, and inclusivity (Dovleac et al., 2023). In this proposed hybrid learning environment, robotic systems provide human instructors and students with both technical support and emotional intelligence. Human creativity and critical thinking complement the efficiency, scalability, and data-driven precision of AI systems in this mutually beneficial interaction. Education 6.0 sees technology, and more specifically robots, as active agents in the learning process, able to facilitate social interactions, assessment tasks, and even provide students with emotional feedback, in contrast to earlier stages of educational evolution that emphasised the integration of technology as a tool (Almusaed et al. 2023). Robot tutors, intelligent learning platforms, and AI-driven assessments are a few examples of how generative AI is helping to propel the education industry into the next generation. In addition to streamlining administrative processes, these tools help personalise instruction based on each student's unique learning style, speed, and results. For example, GenAI can instantly evaluate a student's comprehension of a subject and offer feedback, while robot tutors recreate important social scenarios found in fields such as psychology and sociology. These AI systems serve as educational partners, augmenting the capacities of human teachers and paving the way for more dynamic and intriguing classroom discussions.

By combining social cognitive theory with AI technology, the integration of robots and humans in the classroom is becoming a reality (Onososen et al., 2024). Artificial intelligence's ability to build social environments and interactive simulations is in line with Bandura's social cognitive theory, which emphasises learning through observation, imitation, and interaction (Ott, 2024). Here, GenAI-enabled robot tutors can simulate intricate social scenarios, giving students a chance to practice role-playing and problem-solving skills that are reflective of real-life interactions. Lee and Tseng (2024) and Goel (2024) illustrate the symbiotic relationship in Education 6.0 by combining human-like social interactions with machine precision.

Several real-world applications of robot-human collaboration in education reflect the growing harmony between robots and humans. ChatGPT and Squirrel AI, for example, are AI-driven platforms in China that offer individualised tutoring, guide students through difficult subjects with algorithmic guidance, and provide emotional and motivational support with the help of natural language processing (NLP) (Liu et al., 2023) assert that these platforms serve as a supplement to human teachers, providing pupils with continuous support outside of the classroom. Students across the globe are using robot tutors like Nao and Pepper to improve their learning experiences (Rossi et al. 2024), whether it is the acquisition of a new language or the mastery of mathematical concepts. These robots can create a more humane relationship by responding to verbal and non-verbal cues, adapting their teaching approaches based on student emotions, and utilising their sensors and AI capabilities. Because emotional intelligence and flexibility are critical for successful learning, this is particularly true in the fields of special needs education and early childhood education. The World Economic Forum (WEF) asserts that empathic responses from AI and robots, which create realistic simulations of social interactions and demonstrate the intertwining of human emotions with machine logic, can assist students in developing emotional resilience.

2.2. Human and robot educators working together

In Education 6.0, the role of human teachers shifts from being mere disseminators of information to facilitators and mentors. To

ensure that AI-generated content adheres to pedagogical goals and ethical standards, teachers collaborate with robots and GenAI systems to guide students through challenging problem-solving tasks. Thanks to this collaboration, teachers can devote more time and energy to the three domains of intelligence where humans really shine: critical thinking, creativity, and social-emotional learning. On the other hand, artificial intelligence and robots handle repetitive tasks such as grading, providing instant feedback, and creating individual lessons based on student performance data (Mohammadian and Wittberg, 2024). This demonstrates how the partnership between human teachers and robots in Education 6.0 fosters mutual improvement. The analytical power and efficiency of AI support human teachers, freeing them up to devote more time to enhancing students' higher-order thinking skills.

In addition, this collaboration addresses the teacher shortage problem that affects many countries, especially rural or poor areas that may struggle to find competent teachers. Robots can contribute to closing the global education gap by offering students in these areas personalized and adaptive instruction using automated and intelligent tutoring systems. To address key ethical issues as we continue to integrate robotics and AI into schools. The potential for bias in AI systems is a major concern because, if not properly addressed, it can inadvertently perpetuate prejudice or stereotypes. GenAI systems trained on biassed datasets, for example, have the potential to reinforce inequality based on gender, race, or socioeconomic class. Thus, to achieve a balanced vision of Education 6.0, it is critical to ensure that AI systems are open, fair, and accountable. As AI systems handle increasingly sensitive student information, data privacy and security become more important. To protect student information and ensure its ethical use, educational institutions must implement robust policies.

Future developments in AI-human interaction, such as the creation of more emotionally intelligent robots and the enhancement of AI systems to better mimic human learning processes, will likely be part of the Education 6.0 evolution. Classrooms will undergo a radical transformation as these technologies advance, becoming interactive learning spaces where artificial intelligence and human intelligence collaborate to improve student achievement (Magni et al., 2024). Ultimately, Education 6.0 marks a revolutionary era where humans and machines are already working together in the classroom. As a result of GenAI advancements, AI-powered, intelligent platforms and robotic tutors are enhancing the role of human educators by developing more customised and flexible lesson plans for their students. The alignment between these entities not only improves learning efficiency but also addresses issues like teacher shortages and global educational inequality. Educators must carefully handle this integration, taking ethical considerations into account, to ensure equity and fairness in an AI-driven education system. Ever-evolving technology will transform the future of learning by realising a fully harmonised Education 6.0, bringing together the best of human and machine intelligence.

3. Methodology

This study uses a survey design and a quantitative research method to look into the structural relationships between social cognition and generative artificial intelligence (GenAI). The study focuses on using ChatGPT as a robotic tutor in a sociology classroom. The survey design facilitates the collection of data on students' perceptions, attitudes, and behavioural intentions regarding the integration of ChatGPT in classroom learning. The primary objective of the study is to investigate how ChatGPT, as a GenAI-driven robot tutor, influences students' learning experiences in sociology and to assess the relationship between social cognitive factors and students' engagement with the technology.

3.1 Participants

The study sample consists of 27 students enrolled in a sociology course at a higher education institution. We selected the students through convenience sampling, considering their prior exposure to ChatGPT and its integration into their sociology curriculum. The participants ranged in age from 18 to 25 years, representing a diverse mix of gender and academic backgrounds. We briefed all participants on the research objectives, and they provided informed consent to participate in the study.

3.2. Instruments

This study employed two main instruments, observation, and a structured questionnaire, to measure students' perceptions and the structural relationship between social cognition and GenAI. We designed both instruments to capture the relevant variables involved in the interaction between students and the ChatGPT robot tutor

1. Observation Instrument: During sociology lessons, we used the observation tool to record students' interaction patterns with ChatGPT. The observational data focused on student engagement with the ChatGPT tutor. Collaborative behaviour during problem-solving tasks. Feedback exchange between ChatGPT and students. ChatGPT facilitates instances of peer-to-peer interaction. The observer noted how students used ChatGPT to navigate complex sociological theories and real-life case studies. Additionally, interactions that showcased social cognitive elements, such as observation, imitation, and the modelling of behaviours, were recorded.

2. Questionnaire: To assess the students' attitudes and behavioural intentions toward using ChatGPT in sociology learning, we administered a structured questionnaire. I divided the questionnaire into two sections. Section 1 collected demographic information. Section 2 included 20 items designed to measure variables related to social cognition, performance expectancy, effort expectancy, social influence, and behavioural intention using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire included the following sample items: "I find it easy to use ChatGPT to solve sociological problems. "ChatGPT helps me better understand complex sociological concepts. "I feel confident in using ChatGPT during group discussions. ChatGPT makes learning sociology more interactive and engaging."

3.3. Procedure

Over a four-week period, the study involved students participating in sociology lessons that integrated ChatGPT as a robot tutor. The procedure involved the following steps: at the beginning of the study, the researchers introduced ChatGPT to undergraduate students, demonstrating its usefulness as a tool for learning sociology by guiding them on how to ask questions, seek clarification on sociological theories, and engage in problem-solving. Over a four-week period, ChatGPT served as the primary platform for students to understand complex sociological concepts and theories, simulate social interaction scenarios, and seek clarification on theoretical frameworks such as Marxism and functionalism. Students also collaborated with peers using ChatGPT for data analysis and feedback.

During these lessons, the researchers observed students' interactions with ChatGPT and with each other, focussing on their level of engagement, collaborative learning strategies, and the impact of ChatGPT on their understanding of sociology. At the end of the study, students completed their artefacts and uploaded them to YouTube and other social media accounts, and we asked them to complete a structured questionnaire to evaluate their experiences with ChatGPT, assessing its usefulness, effectiveness, and their intentions regarding future use of AI-based educational tools.

3.4 Data Analysis

This study used the Statistical Package for the Social Sciences (SPSS) software to analyse the obtained data. The researcher used descriptive and inferential statistical methods to study the relationship between GenAI and social cognition in the classroom. The researcher calculated the results of the descriptive statistical student score data analysis to understand the students' attitudes toward ChatGPT and their level of engagement in the sociology class. This included things like mean, standard deviation, and frequency distribution. The researcher conducted Cronbach's alpha test to establish the internal consistency of students' attitudes and intentions towards using ChatGPT as a robot instructor, as well as to ensure the reliability of the questionnaire's Likert scale items.

In addition, Pearson's correlation coefficient was used to conduct a correlation analysis that looked at how social cognitive variables such as behavioural modelling and imitation correlated with students' intention to continue using ChatGPT. Students' propensity to accept ChatGPT correlated with variables such as performance expectancy, effort expectancy, and social influence, as indicated by this. Finally, we identified the most significant factors influencing students' future use of ChatGPT for learning through multiple regression analysis, which predicted their behavioural intentions based on the independent variables. These variables included performance expectation, effort expectation, social cognition, and supportive conditions.

An example of the use of ChatGPT in the classroom involved a case study in which students explored the sociological concept of social stratification. The students interacted with ChatGPT to simulate a society with varying levels of social mobility. Through this simulation, they were able to observe how different social groups interacted, ask ChatGPT for insights on economic inequality, and collaboratively discuss their findings with peers. The observation revealed that students who engaged more with ChatGPT exhibited higher levels of cognitive engagement and performed better in the post-test on social stratification concepts.

4. Results and Discussion

4.1 Social Cognitive through virtual robot

This study aimed to investigate the structural relations between social cognition and GenAI in the form of ChatGPT as a robot tutor in sociology education. By combining observation with a structured questionnaire, the research provided insights into how students interact with AI-driven tools and how these tools impact their learning experiences. We expect the analysis of the findings using SPSS to enhance our understanding of how GenAI enhances student engagement and improves educational outcomes in sociology.

Table 1. Social Cognitive Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
1. I find that interacting with ChatGPT helps me model behaviours observed in sociological scenarios	23	3.00	5.00	4.3043	.63495
2. Through observation and feedback, ChatGPT encourages me to think critically about social issues.	23	3.00	5.00	4.0000	.67420
3. Using ChatGPT allows me to engage in problem-solving activities similar to real-life social interactions	23	3.00	5.00	4.3913	.58303
4. I believe that using ChatGPT improves my understanding of complex sociological concepts	23	3.00	5.00	4.3043	.63495
5. ChatGPT helps me perform better in sociology assignments and exams	23	3.00	5.00	4.3913	.65638
6. I find ChatGPT effective in helping me analyse and understand sociological theories.	23	3.00	5.00	4.0000	.67420
7. The feedback I receive from ChatGPT enhances my performance in group discussions	23	3.00	5.00	4.3913	.65638
8. It is simple for me to interact with ChatGPT to complete my sociology assignments.	23	3.00	5.00	4.1739	.65033
9. I find ChatGPT's functions intuitive and easy to learn	23	3.00	5.00	4.4783	.59311
10. Using ChatGPT requires little effort for me to achieve my learning objectives.	23	3.00	5.00	4.4783	.66535
11. I am able to quickly find answers to my sociology-related questions using ChatGPT.	23	3.00	5.00	4.2609	.75181
12. My classmates encourage me to use ChatGPT in our sociology coursework	23	3.00	5.00	4.4783	.59311
13. My peers and instructors believe that using ChatGPT is beneficial for learning sociology.	23	3.00	5.00	4.4348	.66237
14. In future sociology courses, I intend to continue using ChatGPT as a learning tool.	23	3.00	5.00	3.8261	.71682
15. I will recommend ChatGPT to other students for learning sociology concepts	23	3.00	5.00	4.5652	.58977
16. I intend to explore more AI-based tools, like ChatGPT, to improve my learning experience	23	3.00	5.00	4.3043	.63495
17. I am likely to use ChatGPT in other subjects beyond sociology	23	3.00	5.00	4.3913	.72232
18. I find ChatGPT effective in helping me analyse and understand sociological theories.	23	3.00	5.00	4.1739	.65033
	23	3.00	5.00	4.2609	.68870
19. ChatGPT helps me better understand the behaviours of different social groups in sociology case studies	23	3.00	5.00	4.4783	.59311
20. I anticipate that using ChatGPT as a tutor will improve my overall academic performance.					
Valid N (listwise)	23				

Table 1 of descriptive statistics provides valuable insights into how students perceive ChatGPT's role in supporting their sociology learning. The mean scores across all items fall within the 3.00 to 5.00 range, indicating a generally favourable view of ChatGPT's utility in the learning process. Most mean values are above 4.0, showing that students agree or strongly agree with the positive statements about ChatGPT's efficacy in aiding sociological learning.

The highest mean score (4.5652) is for the item, "I will recommend ChatGPT to other students for learning sociology concepts," suggesting that most students are highly satisfied with the tool's ability to support their academic endeavors. Statements like "ChatGPT enhances my performance in sociology assignments and exams" (M = 4.3913) and "ChatGPT aids in my analysis and understanding of sociological theories" (M = 4.3913) closely follow. These high scores indicate that students find ChatGPT particularly useful for academic performance and conceptual understanding.

Items like "I find ChatGPT's functions intuitive and easy to learn" (M = 4.4783) and "Using ChatGPT requires little effort for me to achieve my learning objectives" (M = 4.4783) receive strong positive feedback, highlighting the tool's ease of use. This suggests that students find the tool accessible and straightforward to integrate into their learning routines.

Conversely, the lowest mean score (3.8261) is for the item, "In future sociology courses, I intend to continue using ChatGPT as a learning tool." While still positive, this lower score suggests that a few students may be less certain about long-term reliance on the tool for future courses. The standard deviations for most items are relatively low, indicating consistency in the responses. However, the slightly higher standard deviation for the intention to use ChatGPT in future sociology courses (SD = 0.71682) indicates a wider variance in opinions on this particular aspect. Overall, the data indicate that students generally perceive ChatGPT as an effective, intuitive tool that enhances their learning experience, particularly in areas such as problem-solving, understanding sociological concepts, and performing better academically.

4.2 Behavioral Intention with robot tutor

Table 2. Behavioral Intention Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
1. GenAI helps me better understand social cues in conversations.	23	3.00	5.00	4.0870	.79275
2. Using GenAI enhances my ability to interpret emotions in others	23	3.00	5.00	4.2609	.68870
3. GenAI improves my ability to recognize facial expressions and body language	23	3.00	5.00	4.1304	.69442
4. I find that interacting with GenAI makes me more empathetic toward others	23	2.00	5.00	4.2174	.90235
5. GenAI helps me develop my communication skills.	23	3.00	5.00	3.9130	.79275
6. Using GenAI increases my awareness of cultural differences in social interactions	23	3.00	5.00	4.3043	.70290
7. GenAI helps me practice effective conflict resolution in social scenarios	23	3.00	5.00	4.3478	.64728
8. Interacting with GenAI improves my active listening abilities	23	3.00	5.00	4.2609	.61919
9. I feel more confident in handling social situations after interacting with GenAI	23	3.00	5.00	4.2609	.61919
10. GenAI enhances my understanding of others' perspectives in conversations	23	3.00	5.00	4.0870	.59643
11. I believe GenAI can help improve my emotional intelligence	23	3.00	5.00	4.2609	.61919
12. Using GenAI helps me become more aware of the social dynamics in group interactions	23	2.00	5.00	4.2174	.79524
13. GenAI helps me develop my ability to engage in meaningful discussions.	23	2.00	5.00	3.8261	.77765
14. In real-world situations, I can effectively apply social skills learned from GenAI	23	3.00	5.00	4.3043	.63495
15. GenAI encourages me to think more critically about social issues	23	3.00	5.00	4.1304	.62554
16. Interacting with GenAI increases my sensitivity to social norms and expectations.	23	3.00	5.00	4.2174	.73587
17. I find that GenAI offers valuable feedback on my social behaviours	23	3.00	5.00	4.0870	.66831
18. GenAI simulations of social scenarios feel realistic and helpful for practice	23	3.00	5.00	4.1304	.75705
19. The use of GenAI enhances my problem-solving skills in social contexts	23	3.00	5.00	4.3043	.63495
20. I believe GenAI is a useful tool for developing social awareness	23	3.00	5.00	4.1739	.65033
Valid N (listwise)	23				

The descriptive statistics from Table 2 on the use of GenAI as a robotics tutor reveal generally positive perceptions, with all items receiving mean scores above 4.0, indicating strong agreement on its effectiveness for developing social skills. The tool "GenAI helps me practice effective conflict resolution in social scenarios" received the highest mean score (M = 4.3478), highlighting its perceived value in promoting practical social skills and resolution techniques in complex interactions.

Another notable result is the mean score for "Using GenAI increases my awareness of cultural differences in social interactions" (M = 4.3043), indicating that respondents find it valuable in enhancing their sensitivity to multicultural contexts. Similarly, statements regarding its role in boosting confidence in handling social situations (M = 4.2609) and enhancing emotional intelligence (M = 4.2609) suggest that participants view GenAI as a tool for building interpersonal skills. Researchers found slightly lower but still

positive scores for "GenAI helps me develop my communication skills" (M = 3.9130) and "GenAI helps me develop my ability to engage in meaningful discussions" (M = 3.8261). While these scores indicate satisfaction, they suggest that participants may feel room for improvement in how GenAI supports verbal communication and deeper discussion engagement.

Standard deviations across most items range from 0.6 to 0.8, reflecting moderate agreement among participants. However, items like "I find that interacting with GenAI makes me more empathetic toward others" (SD = 0.90235) and "Using GenAI helps me become more aware of the social dynamics in group interactions" (SD = 0.79524) indicate some variability in responses, suggesting that certain participants experience these benefits more than others. Overall, the data demonstrate that people view GenAI as a useful educational tool for enhancing social cognition, problem-solving, and empathy while also pointing out areas where its influence on communication and discussion skills may need more development.

Table 3. Reliability Statistics

Variables	Cronbach's Alpha	N of Items
Social cognitive	.956	20
Robotics Tutor	. 950	

The findings in Table 3 present reliability statistics using Cronbach's alpha, a measure of internal consistency that indicates how closely related a set of items are as a group. In this case, it evaluates the reliability of two constructs: Social cognitive and robotics tutor. Social cognitive variables. Cronbach's alpha = 0.956 for 20 items. This extremely high value suggests excellent internal consistency, meaning the items that assess social cognition are highly correlated and measure the same underlying construct. Practically speaking, this signifies a consistent alignment between survey questions on users' perceptions of the social cognitive impacts of tools such as ChatGPT or GenAI. Robotics tutor variables Cronbach's alpha = 0.950, also indicating excellent internal consistency for the set of items under the Robotics Tutor construct. This suggests that the questions relating to how well GenAI functions as a tutor consistently capture the same overall concept.

Both values exceed the typical threshold of 0.70, which is considered satisfactory for reliability. We can see that the items have values above 0.90, which means they are very closely related. This is strong evidence that the questionnaire items are consistently measuring the intended dimensions of social cognition and robotics tutoring effectiveness with little measurement error. This makes the survey results highly reliable for further analysis and interpretation.

4.3 The correlation between social cognitive and robotics tutor in learning.

Table 4. Correlations

		Social cognitive	Robotics Tutor
Social Cognitive	Pearson Correlation	1	.198
	Sig. (2-tailed)		.365
	N	23	23
Robotics Tutor	Pearson Correlation	.198	1
	Sig. (2-tailed)	.365	
	N	23	23

Table 4 presents the correlation analysis between the two variables, social cognitive and robotics tutor. The table provides Pearson correlation coefficients and their significance levels (Sig. (2-tailed) to measure the strength and direction of the linear relationship between these two variables. The Pearson correlation between social cognitive and robotics tutor is 0.198. This positive but weak correlation suggests that there is a slight relationship between users' social cognitive abilities and their perceptions of the robotics tutor (GenAI).

However, the strength of this relationship is minimal, indicating that higher scores in one variable do not strongly predict higher scores in the other. The Sig. (2-tailed) value is 0.365, which is greater than the commonly used threshold of 0.05 for statistical significance. This means that the observed correlation is not statistically significant. In other words, the weak correlation between social cognitive and robotics tutors could be due to random chance, and there is no strong evidence to conclude a meaningful relationship between these two variables in the sample. Overall, the data suggest that while both social cognitive and robotics tutor variables are independently reliable (as seen from previous tables), they do not significantly correlate with each other based on the sample data.

Table 5. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.198[a]	.039	-.007	9.68905

a. Predictors: (Constant), robotics tutor

Robotics tutor used as a predictor for social cognitive abilities in a simple linear regression analysis, as presented in the model summary table. The R value (0.198) indicates a weak positive correlation between the two variables, suggesting that changes in the robotics tutor variable have only a minimal relationship with changes in social cognitive outcomes. The R Square value (0.039), or the coefficient of determination, indicates that the robotics tutor variable only explains 3.9% of the variance in social cognitive abilities, indicating that robotics tutor is not a strong predictor in this context.

The adjusted R Square (-0.007) accounts for the number of predictors and reveals a slight negative value, indicating that the model performs worse when the robotics tutor variable is included than when no predictors are used. This underscores the minimal contribution of robotics tutor to explaining variations in social cognition. The standard error of the Estimate (9.68905), which shows the average difference between observed and predicted values, is also pretty high. This adds to the evidence that the model is not very good at predicting social cognitive outcomes.

Overall, the model demonstrates a weak and non-significant relationship between robotics tutor and social cognitive abilities, with little predictive power. This suggests that other factors play a greater role in shaping social cognitive outcomes within this sample.

Table 6. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.394	1	80.394	.856	.365[b]
	Residual	1971.432	21	93.878		
	Total	2051.826	22			

a. Dependent Variable: Social cognitive

b. Predictors: (Constant), Robotics Tutor

The ANOVA table displays the results of the variance analysis for the regression model, where social cognitive is the dependent variable and robotics tutor is the predictor. The regression Sum of Squares (80.394) indicates the predictor-explained variation, while the Residual Sum of Squares (1971.432) indicates the unexplained variation. The model yields an F-value of 0.856, indicating the ratio of the model's explained variance to the unexplained variance. However, the associated p-value (Sig. = 0.365) is well above the commonly accepted threshold of 0.05, meaning the model is not statistically significant. Thus, robotics tutor do not significantly predict social cognitive abilities, and the variance in the social cognitive outcomes is largely unexplained by this model.

Table 7. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	70.249	17.234		4.076	.001
	Robotics Tutor	.190	.205	.198	.925	.365

a. Dependent Variable: Social cognitive

The coefficients table displays the outcomes of a regression analysis, utilizing a robotics tutor as a predictor for the dependent variable, social cognitive. Robotics tutor is zero, and the constant (70.249) indicates the expected value of social cognitive. The unstandardised coefficient (B = 0.190) for robotics tutor suggests that for each unit increase in robotics tutor, social cognitive increases by 0.190 units. However, the p-value (Sig.= 0.365) is greater than 0.05, indicating that this relationship is not statistically

significant. The standardised coefficient (Beta = 0.198) also indicates a slight positive influence of robotics tutors on social cognitive abilities, yet this impact is insignificant and lacks significance according to the data.

The primary goal of this study was to better understand how social cognition relates to the use of GenAI, and more specifically ChatGPT, as a robotic tutor in sociology classes. The results of reliability, descriptive statistics, and regression analyses reveal a lot about the impact of GenAI on students' education. To begin, the descriptive statistics show that students view ChatGPT as a useful resource for better understanding sociological ideas. Most students (with mean scores above 4.0) were highly satisfied with ChatGPT's capacity to improve their problem-solving skills, conceptual understanding, and overall academic achievement, in light of Wang et al. (2024). After using GenAI in their lessons, students reported improved performance on exams and assignments and greater engagement with complex sociological theories. High scores on elements measuring the tool's intuitiveness indicate that students found ChatGPT easy to use and integrate into their daily schoolwork.

However, a more nuanced picture emerges from the regression analysis. The results show that students recognise the value of GenAI technologies like ChatGPT, but there is little relationship between social cognition and the use of robotic instructors. A Pearson correlation coefficient of 0.198 indicates a weak positive relationship between social cognition and GenAI use, but this relationship is not statistically significant ($p = 0.365$). GenAI may not have a big effect on students' social and cognitive development on its own; other factors, like teacher involvement and classroom dynamics, may have a bigger effect. The R square value of the regression model showed that GenAI only explained 3.9% of the variation in social cognition.

The moderate engagement of students with ChatGPT is encouraging; the lower mean score of the question "In future sociology courses, I intend to continue using ChatGPT as a learning tool" (3.8261) raises concerns about their long-term confidence in GenAI. Even though ChatGPT helps them in the short term, students may not see its long-term benefits. Furthermore, these results underscore the significance of addressing pedagogical and infrastructural challenges to expand the use of GenAI in schools, aligning with the findings of Fullan's (2024) research. Stronger teacher training and classroom integration tactics are necessary to maximize AI's potential to improve learning outcomes, particularly given the weak correlation between GenAI use (Kurtz, 2024) and social cognition (Al Yakin, 2024). To ensure equitable and successful implementation in sociological education, a field centred on themes of race, class, and gender, the study also highlights ethical considerations, such as the potential for bias in AI systems.

For all its potential to improve educational outcomes, GenAI's impact on social cognition remains limited due to the lack of an adequate framework.' social and academic development should be the subject of future studies that investigate how to more efficiently incorporate GenAI into the classroom.

5. Conclusion

This study sheds light on the integration of GenAI-powered robotic tutors into Indonesian sociology curricula, focussing on their impact on students' social cognition and learning outcomes. Students viewed ChatGPT as a useful tool to enhance their understanding of sociology topics, develop their critical thinking skills, and participate more actively in interactive learning environments, according to the study results. However, correlation analysis showed that there was little relationship between social cognition and the use of robotic instructors, even when these perceptions were positive. It appears that classroom dynamics and instructor engagement are more important than the technology itself in terms of influencing children's social cognitive development. To fully reap the benefits of AI-driven tools in education, it is essential to support their adoption with thorough teacher training and a well-structured pedagogical framework.

It is important to note that this study has several limitations. First, the results may not be applicable to other educational settings due to the limited sample size (27 students). Second, the study did not consider the long-term implications on learning outcomes; it focused on the short-term consequences of GenAI integration. Thirdly, the study may exhibit bias due to its exclusive focus on a single school, thereby restricting the diversity of perspectives and experiences it encompassed. Another limitation is that alternative AI-driven tools may have different effects on student learning than ChatGPT, which was the only tool considered in the study. Finally, the study failed to adequately address potential cultural and ethical biases in AI systems, particularly when it comes to sensitive sociological topics such as gender, race, and class.

This study makes several important contributions to the study of AI in education. It provides evidence of positive student views of the role of AI in enhancing problem-solving, engagement, and conceptual understanding and highlights the potential of GenAI tools like ChatGPT to connect sociological theory to practice. Furthermore, this study highlights the importance of ethically sound and culturally sensitive AI systems to prevent the reinforcement of bias, particularly in areas that address sensitive social issues. We cannot overstate the importance of classroom dynamics and teacher training when discussing the effective integration of AI-

driven tools into educational settings.

Future research should focus on several key areas to expand on these findings. For starters, if the sample included children from more school areas, the results would be more applicable to a broader population, and the long-term effects of GenAI integration on students' social cognition and academic performance must be investigated. Third, to fully understand the potential of AI tools in various classrooms, it would be useful to study how they work beyond just ChatGPT. Developing frameworks that ensure fairness, transparency, and inclusivity is essential to addressing the cultural and ethical challenges of AI adoption. Finally, to ensure that educators are adequately prepared to use this technology successfully in the classroom, future research should investigate the function of teacher training programs that focus on integrating AI into pedagogy.

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