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Unlocking Potential: A Teacher's Lens on Artificial Intelligence Towards Students' Problem-Solving Skills

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Abstract

The advancement of information technology is opening up new avenues for integrating artificial intelligence into education. However, there is a prevailing belief that the use of AI could impact students' problem-solving abilities. This research seeks to explore teachers' perceptions regarding the potential influence of artificial intelligence on these skills. Utilizing a quantitative approach, the study involved a survey conducted with 57 participants. Data was collected through a questionnaire and subsequently analyzed descriptively. The findings reveal several key insights: (1) teachers generally agree that AI, particularly tools like ChatGPT, can enhance students' engagement in problem-solving activities, (2) the primary challenge in implementing AI is navigating ethical concerns, and (3) students indeed benefit from the support of AI in problem-solving tasks, especially in the area of formulating solutions. These results underscore the importance of encouraging the integration of AI technologies, such as ChatGPT, into teaching methods in elementary schools. Such integration could foster a more interactive and adaptive development of students' problem-solving skills. Moreover, the positive views held by teachers about using AI in education serve as a solid foundation for creating training programs aimed at enhancing educators' knowledge and ability to effectively integrate technology into their teaching practices.

INTRODUCTION

The education sector has experienced substantial changes with the advancement of information and communication technology. One of the most recent innovations in this field is artificial intelligence (AI). AI is a representation of human cognitive functions, based on the idea that intelligence operates computationally. As a result, the human mind can theoretically be simulated as a program running on a computer (Solum, 2008).

Artificial intelligence (AI) refers to the application of computers and technology to replicate human-like intelligence and critical thinking (Malik, 2019). Learning itself is a fundamental characteristic of intelligent behavior (Mitchell, 2019). However, AI does not entirely replace human roles. Instead, managing AI requires skills in communication, leadership, and coordination, particularly in monitoring the evolving capabilities of computing in handling complex decision-making processes (Berente, 2021).

This technology facilitates human-machine interaction, enhancing efficiency and effectiveness in various fields, including education (Alviani, 2022). To improve education quality, teachers must actively integrate technology creatively and innovatively into their teaching practices (Lestari, 2018).

The rapid development of AI has led to its integration into numerous aspects of daily life, including education. Understanding how AI influences learning and student skill development is crucial. AI-powered platforms like ChatGPT offer significant potential to enhance learning quality. ChatGPT, developed by OpenAI, is a virtual assistant that supports teachers and students by delivering learning materials, answering questions, and providing instant feedback. Machine learning technology also enables AI to analyze how writers construct their ideas (Sobel, 2017).

AI is increasingly being explored for its potential to empower teachers by enabling personalized learning, identifying struggling students, and recommending educational resources (Chounta, 2022). Given its capabilities, AI has the potential to revolutionize educational technology.

Teachers' perceptions play a key role in determining how ChatGPT is utilized in education. Perception refers to how individuals interpret their surroundings based on sensory impressions. A person’s actions are influenced by their perception of a situation. Since different people may interpret similar situations differently, their responses may also vary. Both internal and external factors contribute to shaping an individual's perception of technology.

Understanding teachers' perspectives on AI provides valuable insights into its implementation in elementary school education. One of the major challenges associated with AI in education is ethical considerations (Saputra, 2023). In just five days, OpenAI's GPT-3-powered ChatGPT attracted one million users (Firat, 2023).

Further research is needed to examine how teachers perceive this technology, particularly regarding its impact on students' problem-solving abilities, to ensure effective AI integration in elementary education.

Indonesia faces significant challenges in enhancing the quality of elementary education, particularly in terms of cognitive skills. Problem-solving is a fundamental ability for elementary students, as it involves applying knowledge and experience-based thinking strategies to achieve goals (Lertyosbordin, C., Maneewan, S., & Srikaew, D., 2021). These skills not only impact academic performance but also help students tackle real-life challenges.

Problem-solving involves systematically identifying factors and facts (Jonassen, 2011). Various researchers have outlined its key components. Bransford and Stein (1993) propose five steps: identifying, defining, exploring, acting, and reviewing. Similarly, Foshay and Kirkley (2003) describe problem-solving as a structured process involving identifying and defining the problem, exploring solutions, implementing strategies, and evaluating outcomes. Additionally, Polya (2004) introduces a four-step approach widely used in mathematics: understanding the problem, formulating a plan, executing the plan, and reviewing the solution.

Based on these models, this study identifies five core components of problem-solving skills:

1. Identifying the problem – Understanding the issue, its constraints, and what needs to be resolved.
2. Determining the goal – Sorting relevant information to establish a clear objective.
3. Formulating a solution – Generating alternative approaches and assessing them to devise a suitable solution.
4. Implementing the solution – Applying the chosen strategy.
5. Evaluating the outcome – Measuring success and reviewing the effectiveness of the solution.

A previous study by Rachmadtullah (2024) examined elementary school teachers' views on AI for developing learning media. Conducted through a qualitative study involving three teachers, the research highlighted AI's widespread use among educators. Expanding on this, the present study explores teachers' perceptions of AI, specifically ChatGPT, and its impact on students' problem-solving abilities at the elementary level. This study aims to answer three key research questions:

1. How do teachers perceive the benefits of AI (ChatGPT) in developing problem-solving skills?
2. What challenges do teachers identify in using AI (ChatGPT) for problem-solving skills?

3. What are teachers' views on AI's potential role in different aspects of problem-solving?

By examining teachers' insights, this research seeks to identify opportunities for effectively integrating AI into elementary education. The findings are expected to offer valuable recommendations for educational institutions, teachers, and technology developers, guiding the optimization of AI to enhance student learning. Additionally, the results will contribute to curriculum development, instructional strategies, and the use of AI technology to strengthen students' problem-solving abilities in elementary education.

METHODS

The quantitative survey approach was used in this study to reach many teachers and find a broad and measurable perception of ChatGPT's influence on elementary school students' problem-solving ability. The subjects in this study are elementary school teachers in Blitar City, a total of 57 people. The instrument used in this study is a Google Form (Gform) questionnaire consisting of 35 items using the Likert scale (1-5) (Nemoto, T., & Beglar, D., 2014). The statement on the questionnaire item consists of three aspects: the benefit aspect, the challenge aspect, and the problem-solving skill component aspect. The results of the validity test of the instrument showed that the instrument of this study was valid with a calculation of 0.344 > table at a significance level of 0.05% and the reliability of the alpha Cronbach results of 0.89 > 0.7.

The data analysis technique used in this study is descriptive analysis, which includes data distribution based on the percentage of teachers' answers. Percentage analysis is a method used to identify the tendency of respondents' answer frequency and phenomena that occur in the field. This technique also aims to determine the proportion of each answer to each question so that the data obtained can be analyzed more easily.

RESULTS

The results of this study are presented in the form of a pie chart that describes the percentage of teachers' perceptions to describe the results of the research question.

1. Teachers' Perceptions of the Benefits of AI (ChatGPT) on Students' Problem-Solving Skills in Elementary Schools

The following is the percentage of questionnaires that show the data related to teachers' perceptions of the benefits of AI (ChatGPT) on problem-solving skills. There are ten (10) question items and statements in this study to find out teachers' perceptions of the benefits of AI (ChatGPT) on students' problem-solving abilities at

the elementary school level. The results obtained show or provide an idea of the extent of the teacher's perception.

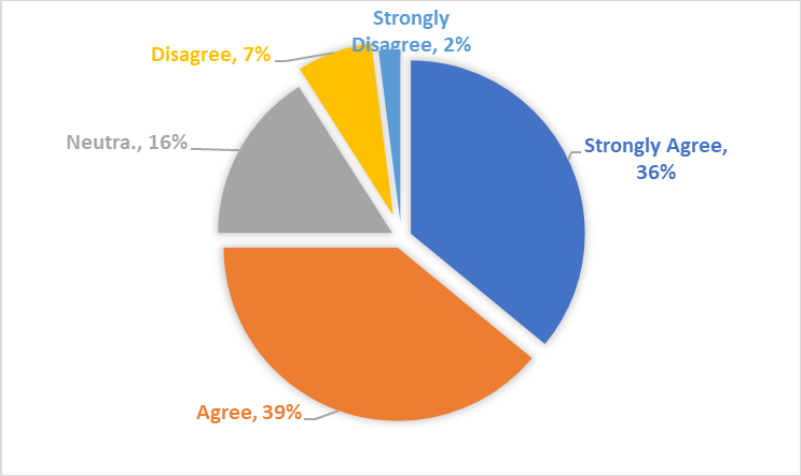

Figure 1. Percentage of Benefit Perception

The diagram above shows data on teachers' perceptions of the benefits of AI (ChatGPT) on students' problem-solving abilities at the elementary school level. As many as 36% of teachers considered that ChatGPT has benefits in helping students solve problems. As many as 39% of teachers, or most teachers, think that ChatGPT has benefits in helping students find ways or solutions to solve problems. This means that as many as 75% of teachers agree and strongly agree that ChatGPT has benefits to help students solve problems.

As many as 16% of teachers are neutral about the benefits of ChatGPT. This can be because teachers still need further experience to be able to provide a perception of the benefits. In total, the perception of teachers who disagree and strongly disagree about the benefits of AI (ChatGPT) on students' problem-solving abilities amounts to 9%. The reason why teachers disagree and strongly disagree based on comments is that elementary school students are still in the stage of concrete operational cognitive development, so they still need learning based on direct experience, which is difficult for ChatGPT technology to facilitate.

The results of teachers' perceptions of the benefits of AI (ChatGPT) on students' problem-solving abilities in elementary schools show that most teachers have a positive perception, even though there are still doubts and disagreements among teachers. This is overcome using a learning approach that accommodates various student learning activities.

2. Teachers' Perceptions of the Challenges of Using AI (ChatGPT) on Students' Problem-Solving Skills in Elementary Schools

The diagram below shows the percentage of challenges in learning using AI (ChatGPT).

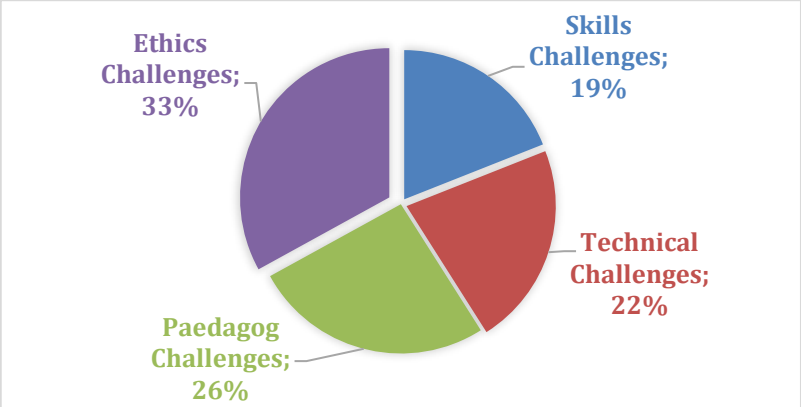

Figure 2. Percentage of Challenge Perception

Based on the data, as many as 33% of teachers perceive the biggest challenge as ethical. As many as 26% of the challenges teachers face are related to pedagogical aspects. The next challenge, with a total of 41%, is the technical challenge and teachers' skills in the use of technology.

Based on data on teachers' perceptions of the challenges of using AI (ChatGPT) on students' problem-solving abilities in elementary schools, these results help show which aspects or dimensions need further attention so that the use of AI can be appropriate or in line with learning objectives without eliminating or ignoring the principles in learning.

3. Teachers' Perceptions of the Use of AI (ChatGPT) on the Components of Students' Problem-Solving Skills in Elementary Schools

The following is the percentage of data related to teachers' perceptions of the potential of AI (ChatGPT) in the problem-solving skills component.

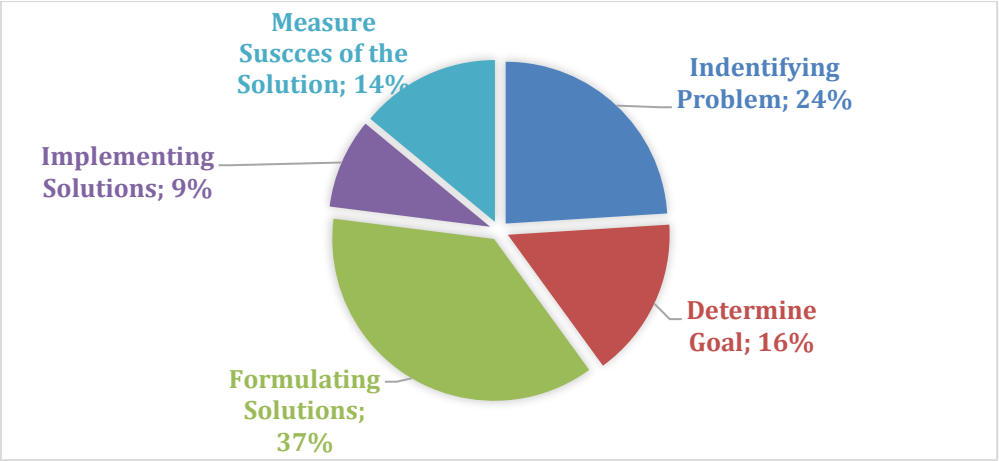

Figure 3: Percentage of Problem-Solving Skills Components

Based on the data of the research results, the largest perception of the use of AI for the component of students' problem-solving skills is in the component of formulating solutions by 37%. Next, as many as 24% of teachers consider that the potential use of AI can be done in the component of problem-solving skills, namely identifying problems. As many as 9% of teachers perceive the potential use of AI (ChatGPT) in the implementation of solutions. As many as 16% of teachers perceive the potential use of AI in the component of determining problem-solving goals. As many as 14% of teachers think that students can use AI (ChatGPT) to measure the success of problem-solving by helping students create success parameters.

DISCUSSION

1. Benefits of AI (ChatGPT) on Students' Problem-Solving Skills in Elementary Schools

One of the aspects that needs to be revealed to find out teachers' perceptions of the use of ChatGPT in learning is the usefulness aspect. Based on the Great Dictionary of the Indonesian Language (KBBI), benefits are use or benefit, profit or profit. From the above understanding, it can be said that the benefit is if something has a use. Based on the statements of Davis (1989) and Adam et al. (1992), technology is defined as the feeling that a person believes the use of a certain technology will improve the person's performance.

Chin and Todd (1995) categorized benefits into two main aspects: usefulness and effectiveness. These benefits include: (1) simplifying tasks, (2) usefulness, which refers to an individual's belief that specific technology provides advantages that enhance their job performance, and (3) increasing productivity, which reflects a person's perception of how technology helps improve their efficiency and output in a given activity. Usefulness refers to the perceived benefits of technology in improving task performance, while effectiveness relates to how well technology helps achieve desired outcomes. Usefulness is more about perception, while effectiveness is about measurable impact. Several factors shape this perception, including prior experience with technology, ease of use, reliability, compatibility with existing workflows, and feedback from peers or experts. External factors like organizational support and training also play a role. Organizations can ensure productivity gains by providing proper training, aligning technology with employee needs, integrating user feedback, and continuously evaluating performance improvements. Additionally, fostering a positive attitude toward technology adoption can encourage engagement and better utilization.

The second aspect, effectiveness, consists of: (1) enhancing effectiveness, where technology usage motivates individuals to improve their daily work activities,

and (2) improving job performance, where technology assists individuals in enhancing their overall performance in their professional field.

This study aligns with previous research highlighting the benefits of artificial intelligence in education. According to Owoc, AI offers at least five advantages in this field: (1) automating assessments by mimicking teachers' grading behavior on student answer sheets, (2) assisting teachers in recalling information they may have forgotten, (3) supporting teachers in providing student evaluations, (4) enabling the creation of virtual facilitators for students, and (5) facilitating personalized learning. Personalized learning involves educational programs that adapt the learning pace and teaching strategies to meet each student's specific needs (Owoc, 2019).

ChatGPT can also help students understand the concepts being learned better by providing customized and interactive explanations (Kalla & Smith, 2023). This is certainly something that needs to be addressed wisely. It is undeniable that technological advances, especially artificial intelligence, provide benefits to facilitate various human activities or jobs. Studies state AI in education has significant potential to improve various aspects of the education ecosystem, including learning, teaching, assessment, and education administration (Roll & Wylie, 2016).

However, this certainly needs to be accompanied by wisdom in using AI (ChatGPT) as a tool for problem-solving. Teachers must expressly limit the use of AI while still providing a larger portion of discussion activities and learning activities that activate students' hands-on and minds-on activities. Hands-on and minds-on activities are done and created by utilizing resources and building thinking skills (Sunn & Yoon, 2022). Through these two activities, students not only learn concepts in problem-solving but also carry out or practice these problem-solving activities. Students can use Chat GPT to reflect on their own progress and learning and determine which areas may need further assistance or direction (Firat, 2023).

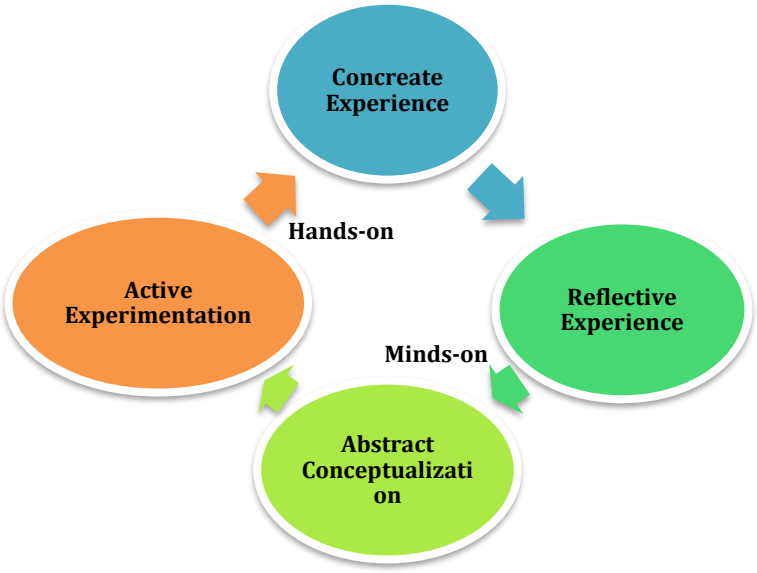

Figure 2. Experiential Learning Cycle (Kolb, 1984)

One of the models that teachers can use to provide these two activities is the experiential learning cycle. Experiential learning emphasizes the importance of hands-on experience as a basis for understanding concepts, developing skills, and shaping attitudes. This concept explains that learning is a cyclical process that involves real experience, reflection, analysis, and application. In this process, students actively interact with the environment, observe the impact of their actions, and explore new ways to solve problems or achieve goals. By integrating theory into real practice, experiential learning encourages deeper, relevant, and contextual learning (Morris, 2020).

The implication of this research on the benefits of artificial intelligence (ChatGPT) is that teachers need to design learning that activates students' hands-on and minds-on, so that the integration of artificial intelligence in minds-on activities is maximized.

2. Challenges of Using AI (ChatGPT) on Students' Problem-Solving Skills in Elementary Schools

Challenges refer to things that create obstacles to something being done. For example, if we want to apply the use of technology in classroom learning, there are obstacles to being able to do so. To realize the use of this technology, efforts are needed to overcome these challenges. Challenges need to be identified in order to develop strategies or steps to overcome these challenges. Successfully identifying these challenges is the main key to implementing something or innovation.

Ethical issues are complex issues that require further review (Huang, 2022). Ethics is a reflective process that is oriented towards experience, social context, and practical outcomes. Ethics is not a fixed rule but a dynamic approach to understanding and guiding human behavior in various situations (Dewey, 2022).

The ethical challenge indicates that there are concerns among teachers about students' misuse of AI. Based on the teacher's comments, it was stated that ethical challenges, such as students not working on answers based on students' own thoughts, besides that ethical problems are also related to the dishonesty of students in doing the tasks given.

The pedagogical challenge is also a challenge in integrating AI (ChatGPT) in learning. Pedagogy is the science that studies how to guide children towards a certain goal, namely, so that they will be able to independently complete their life tasks (Hinchliffe, 2000). In the context of learning, this meaning can be interpreted as pedagogy directing students in various ways of learning so that students can achieve learning goals. Pedagogy is a skill to manage student learning activities, including student understanding, planning and implementing learning process activities, evaluating children's learning outcomes, and developing students to achieve their maximum potential and abilities (Suciana, 2018).

The pedagogical challenges faced by teachers in using ChatGPT in learning are complex issues. ChatGPT, as an artificial intelligence-based technology, offers potential such as providing additional explanations, answering student questions, and supporting interactive exploration of material. However, the integration of these technologies also poses significant pedagogical challenges. One of them is ChatGPT's limitations in understanding the local context, culture, and specific needs of students, so it has the potential to provide less relevant or misleading answers. The issue in this pedagogical challenge is that teachers feel that in the teaching process, it is not only the transfer of knowledge or conveying material to students, but also that teachers instill values in students. This is a challenge if teachers are using ChatGPT, as they feel that technology cannot do this.

The teacher's view of pedagogical challenges in this research is also in line with Nadimpali's opinion that artificial intelligence has risks and misunderstandings in replacing the human element and pays less attention to the emotional dimension of humans, so they view humans more as machines than as humans. If used well, artificial intelligence can be used to transform engagement (Nadimpali, 2017)

This challenge shows that the use of technology in learning is still hindered by problems with facilities and infrastructure as well as teachers' skills in using information technology products. To be able to overcome these challenges, teachers should improve their skills and have support from superiors. Boss support is a social component that affects teachers' use of ICT. The support of superiors will greatly influence teachers' use of ICT devices. The source of support can be in the form of providing facilities, training, and technicians who can help teachers when facing problems (Hudayati, N., Andayani, Y., & Junaidi, E, 2021).

3. Use of AI (ChatGPT) on the Components of Students' Problem-Solving Skills in Elementary Schools

In this study, the purpose of finding out teachers' perceptions of the use of AI (ChatGPT) on students' problem-solving abilities is to find out which components of problem-solving AI (ChatGPT) can be integrated into student problem-solving activities. Most teachers consider that the most appropriate problem-solving component to be integrated with artificial intelligence in the problem-solving component is the component of formulating solutions.

Solution formulation is a crucial step in problem-solving where alternative solutions or actions are developed to address an identified issue. In simple terms, this stage involves exploring ways to improve a situation. Effective problem-solving requires various references, and teachers believe that artificial intelligence can assist them in accessing diverse sources of information. This perspective aligns with the idea that problem-solving research and formal practices begin with the assumption that a problem has already been identified or formulated. The next step in the process is to find a suitable or optimal solution to resolve the issue (Von

Hippel, E., & Von Krogh, G., 2016).This means that teachers consider that in problem formulation, students can use AI (Chat GPT) as a tool to find alternative solutions to problem-solving. In other words, teachers feel that the use of ChatGPT can facilitate independent learning by allowing students to find alternative solutions to questions or problem-solving. This allows students to take initiative in the process of learning problem-solving.

Identifying problems means that students can describe or find problems to be solved. In other words, students define problems. Another way to think about the definition of a problem is to define how big the problem is or even whether there is a problem (Robert Harris, 1998). Identification arises when there are too many unknowns to solve; identification can be achieved by making assumptions about the term (Hubert, 1966). To be able to find the solution, students must understand the variables of the problem. With the help of AI (ChatGPT), it is a source of information that can provide instant access to many references, thus helping students expand their knowledge. This can support students' problem-solving abilities by giving them access to more information.

The small number is due to the teacher's assumption that implementation is a zero-hands-on activity, meaning that students start doing something to overcome the problem. This indicates that ChatGPT is more suitable for conceptual activities to understand problems. To be able to really solve the problem, students must do it directly. The parameters will be very helpful in determining whether the solution is achieved or not.

CONCLUSION

The findings of this study highlight the significant role of artificial intelligence, particularly ChatGPT, in aiding students during problem-solving activities by fostering a deeper understanding of the issues at hand. However, teachers face ethical challenges when integrating AI into the educational landscape. When it comes to enhancing problem-solving skills, AI can be seamlessly woven into the solution-formulation process. Educators believe that AI does not completely take over students' problem-solving efforts; instead, it encourages them to explore the problem more comprehensively, helping them to pinpoint more effective goals or solutions. This underscores the potential for artificial intelligence to be effectively incorporated into problem-solving activities when used thoughtfully and with teacher guidance.

Moreover, the results of this study suggest that encouraging the use of AI technologies, such as ChatGPT, in elementary learning environments can support the development of students' problem-solving skills in a more interactive and adaptive manner. Additionally, the positive outlook teachers have on the use of AI in education could serve as a foundation for creating training programs designed to

enhance their understanding and ability to effectively leverage technology in the learning process.

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