

Primary School Mathematics Teacher Candidates' Opinions Regarding Their Experiences in Posing Problems Using ChatGPT¹

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Abstract: There is a large body of research in the field of mathematics education on problem posing. In recent years, the rapid development of artificial intelligence (AI) technologies and software, and the use of AI tools in mathematics education, as in many other fields, has been spreading and developing rapidly. Generative AI tools have begun to be used effectively in various educational processes, according to need and at various levels. During this transformation process, the question of how to effectively utilize generative artificial intelligence tools in problem posing studies has come to the fore, giving rise to a need for research on this subject. Based on this need, the purpose of this study is to examine the opinions of primary school mathematics teacher candidates regarding their experiences in posing problems in three different types: free, semi-structured, and structured, using the ChatGPT generative AI tool. The research was conducted using a qualitative case study design. A total of 13 teacher candidates, nine female and four male, enrolled in the primary school mathematics teacher education program participated in the research. In the study, teacher candidates were asked to pose five problems of three different types: free (unstructured), semi-structured (posing problems suitable for the result/unit, posing problems suitable for the process, posing problems suitable for the problem statement), and structured. The participants were asked to first pose these problems in a classroom setting using pen and paper, and then using ChatGPT. The data consists of the candidate teachers' opinions on their experiences in creating problems using pen and paper and also using ChatGPT, and then was collected using a questionnaire. In the analysis of the data, the findings obtained by two researchers through content analysis and thematic analysis are presented in tabular format with excerpts from participant opinions. According to the findings, it was found that teacher candidates struggled with organizing the sequence of events, creating a specific framework, posing real-life problems, and ensuring that the problems were appropriate for the student level when posing problems in a pen-and-paper environment. In addition, it was observed that participants used erasers excessively during this process. It was noted that problem posing in ChatGPT is advantageous in terms of automatically generating numbers and stories, saving time, and providing a different perspective. On the other hand, it was stated that there are also negative aspects, such as not being sure that the problem is original, the need to check the accuracy of the problem, making the teacher take the easy way out, reducing the individual's thinking skills, and the problem posed not being understandable and appropriate for students. Based on the research findings, further studies examining the performance of ChatGPT and other generative AI tools in problem posing and solving skills is recommended.

Keywords: *Mathematics Education, Problem Posing, Generative Artificial Intelligence, ChatGPT, Teacher Candidates.*

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1. INTRODUCTION

Throughout history, the knowledge, inventions, and innovations developed by humankind have been used in various ways in education. Computers and the internet, in particular, have fundamentally changed education. In addition, the use of virtual reality, the Metaverse, Web 2.0 tools, and artificial intelligence technologies in education has made technology use more effective and efficient for students (Kutlucan & Seferoğlu, 2024). Educational materials supported by artificial intelligence (AI) technologies enable the emergence of skills such as adapting to new situations, abstract thinking, and interaction (Uğur & Kınacı, 2006). The term artificial intelligence was first coined in 1956 at a workshop held by John McCarthy at Dartmouth College (Arslan, 2020). The term artificial intelligence is expressed in English literature as Artificial Intelligence (abbreviated as AI). Developing and replicating the power of the human mind is one of the goals of AI. Therefore, AI, which focuses on mimicking cognitive processes such as problem solving, thinking, learning, and decision making, is a field that aims to produce machines and computers with human-like intelligence (Aktay, Gök, & Uzunoğlu, 2023). AI systems that are trained using deep learning and neural networks and that can process and generate data and possess human-like language structures are called generative artificial intelligence (GAI) (Bozkurt, 2023). Chat Generative Pre-Trained Transformer (ChatGPT), which stands for Chat-Based Pre-Trained Generative Transformer (Tapan-BROUTIN, 2022), is a GAI technology that processes and uses language (OpenAI, 2022) and is an abstract technology (Bozkurt, 2020). ChatGPT, which brought many innovations and controversies, was launched in November 2022 by the American company OpenAI. With rapidly advancing technology, ChatGPT, an AI-powered language model, is a highly effective tool for solving math problems and answering questions. ChatGPT uses appropriate algorithms to solve the question and also understands user input. This AI is specifically designed to understand formulas, mathematical equations, and similar expressions. ChatGPT first breaks down the question directed at it into smaller pieces and begins to produce solutions by examining these pieces separately (Karabıyık, 2024). AI tools are used in many cognitively demanding tasks (robot management, translation, media production, coding, architectural drawing, complex calculations, optimization, simulation, drug development, health, biotechnology, navigation, etc.) and have also begun to be integrated into education. It has been suggested that AI tools can also be used in problem posing studies, which are a subfield of mathematics education and the focus of this research.

Problem-based learning is an important tool for developing students' problem-solving skills, conceptual understanding, thinking patterns, and attitudes (Cankoy & Darbaz, 2010; English, 1997). It is also closely related to problem-solving skills, which are the most fundamental goal of mathematics education and vary among individuals, requiring development (Ev Çimen & Yıldız, 2017). Although it may seem like a simple writing activity at first glance, problem formulation is an important skill that supports the development of students' problem-solving skills by activating cognitive skills such as thinking, analyzing, and establishing relationships. Stoyanova and Ellerton (1996) define problem setting as a process based on students' mathematical experiences, involving the production of meaningful mathematical problems from concrete situations by adding their personal interpretations to these situations. They divide

this process into three main categories. The first category, free (unstructured) problem posing, involves students freely posing problems based on real or fictional situations. In this context, students select specific elements, define the relationships between them, and then transform the resulting structure into a clear and distinct mathematical problem. In the second category, semi-structured problem posing, students are given a specific situation; they are expected to analyze this situation using the knowledge, concepts, patterns, and skills they have acquired from their previous mathematical experiences and to pose a problem based on this analysis. The third and final category, structured problem posing, is based on a directly given problem or the problem-solving process. In this type of problem posing, students generate a new problem based on an existing problem or its solution.

2. LITERATURE REVIEW

In the literature, Dağhan, Kibar, Çetin, Telli, and Akkoyunlu (2017) examined the characteristics of 21st Century teachers and learners with computer science teacher candidates; as a result, communication technology literacy, instructional design, and information literacy were identified as some of the teacher characteristics. They concluded that some of the learner characteristics were learning preferences, social characteristics, and media literacy. In his study, Cansoy (2018) examined how 21st Century skills could be imparted to students; as a result, and found that literacy skills related to basic content knowledge, information and communication technologies, and basic skills such as problem solving, generating new ideas, collaboration, and communication were strongly discussed. In their study, Şahin and Namlı (2019) examined the attitudes of teacher candidates towards the use of technology in education with the advancement of technology today; as a result, it was found that the use of technology in education was viewed positively by teacher candidates at a moderate level. Dargut and Çelik (2014) examined Turkish language teacher candidates' thoughts on the use of technology in education; as a result, it was found that the majority of teacher candidates had positive thoughts, and it was determined that the reason for these positive thoughts was their preconceptions that computer use facilitates learning. Baltacı and Yıldız (2018) examined how the predict–observe–explain (POE) strategy functioned during pre-service elementary mathematics teachers' solutions of geometrical location problems using the dynamic mathematics software GeoGebra. The findings indicated that the use of the POE strategy during software-supported solutions of geometrical location problems was an effective tool for enabling pre-service mathematics teachers to visualize and identify the intended geometric location. In their study, Bayram and Çelik (2023) investigated the socioscientific effectiveness of AI in relation to scientific reasoning and entrepreneurial skills according to the interdisciplinary 6E learning model approach and collected the opinions of science teacher candidates. As a result, they found that it could be beneficial to implement the activity in science lessons starting from middle school. In their study, Yorgancı and Işık (2019) observed the classification performance of artificial neural networks based on variables such as students' success, study habits, age, and gender using grade point average, and they concluded that artificial neural networks can classify the effects of study habits, gender, and age on overall grade point average using a multi-layer perceptron model. Coşkun and Gülleroğlu (2021) examined the development of AI, a new field, and its relationship with human intelligence, its effects on education, and its

positive and negative aspects in their study. concluding that AI is developing very rapidly, that people need to be guided towards using AI correctly, and that learning and increasing the use of AI in education is very important. In their study, Meço and Coştu (2022) examined documents found by searching for the term “artificial intelligence in education” in the “Google Scholar” and “Higher Education Council (YÖK) national thesis center” databases. concluding that education is beginning to take shape to meet the needs of Generation Z, that mixed and qualitative methods are used most frequently, that studies increased in terms of articles from 2017 to 2021, and that teachers and students were the most common study groups. In his study, Kurtboğan (2023) provided detailed information about AI and investigated its effects on employee performance; as a result, it was observed that AI has positive effects, as there was an increase in employee performance. Timms (2016) conducted research on how AIED (Artificial Intelligence in Education) increases efficiency in education; as a result, it was concluded that the use of AIED in classrooms will require educational data mining by focusing more on students, thereby leading to the emergence of new models. In their study, Hwang and Tu (2021) examined AIME (Artificial Intelligence in Mathematics Education) research using bibliometric mapping analysis; as a result, it was seen that AI technologies could be used in mathematics education through deep learning and from different angles. In his study, Bozkurt (2023) examined the potential and implications of AI in the field of education; as a result, it was concluded that with the increasing prevalence of AI in all areas, better preparations should be made for situations that may be encountered in the future. In his study, Elike (2023) examined the potential risks and societal impacts of ChatGPT, as a result, it was concluded that workers in the workplace may be forced to work for low wages and that it could be used to increase profits for the purpose of supervision and control. Kim, Park, and Young (2025) examined the effects of AI on teaching and learning in their study; concluding that it is important to include AI in teacher training programs, that ChatGPT offers advantages in terms of receiving rapid feedback on problem-solving experiences, posing different types of problems, and various solution strategies, and that it is necessary to control its output due to its tendency to make mistakes. Biton and Segal (2025) examined the experiences of 15 teacher candidates aiming to teach advanced middle school mathematics in using ChatGPT in the mathematical problem-setting process; as a result, they concluded that the use of ChatGPT contributes to improving mathematical problems, demonstrating the relevance of problems to daily life, and identifying potential difficulties for students. Serin and Kepçeoğlu (2025) examined how ChatGPT could assist mathematics teachers in posing creative problems; they concluded that ChatGPT plays a role in promoting teacher training for creativity. In his study, Tapan-Broutin (2023) examined the questions that mathematics teacher candidates asked ChatGPT during their initial experiences with it; as a result, they concluded that the integration of AI tools into the teaching and learning process by mathematics teacher candidates has begun.

In recent years, interest in the use of generative artificial intelligence tools based on natural language processing, such as ChatGPT, are particularly noteworthy for their potential to provide students and teachers with instant feedback, suggest different ways of thinking, and support cognitive processes. Since problem-solving in mathematics education is a complex process directly related to higher-order thinking skills, creativity, and conceptual

understanding, it is important to examine how this process can be supported by technological tools. ChatGPT can reduce the cognitive load of individuals in the problem-posing process and help them structure their thoughts through the examples, alternative problem structures, and linguistic support it offers. In this respect, ChatGPT plays a critical role not only as a tool in the problem-posing process but also as a learning facilitator that triggers thinking and transforms the process.

A review of the literature reveals that AI-supported tools in mathematics education have been primarily focused on problem solving, concept teaching, providing feedback, and their impact on academic achievement; however, only a limited number of studies have examined their role in problem-posing skills. A significant portion of existing studies address problem-posing in traditional teaching environments and do not examine teacher candidates' problem-posing processes in depth in the context of different problem types (free, semi-structured, and structured). Furthermore, it can be said that there are very few studies that address how generative artificial intelligence tools such as ChatGPT affect teacher candidates' experiences in the problem-setting process, how these experiences differ from traditional pen-and-paper environments, and how these differences vary according to problem types.

In this context, the present study aims to fill an important gap in the literature by comparatively examining pre-service elementary mathematics teachers' problem-setting experiences in both traditional pen-and-paper settings and ChatGPT-supported environments. The identification of the difficulties teacher candidates experience with different problem types, the perceived advantages and disadvantages of ChatGPT use, and their attitudes toward the professional use of this tool provides important insights into how and to what extent AI-supported applications can be used in mathematics education. In this respect, the study aims to make original contributions to both the problem-posing skills literature and the use of artificial intelligence in the context of teacher education.

3. METHODOLOGY

This study aimed to investigate the opinions of primary school mathematics teacher candidates regarding their problem-posing experiences using the ChatGPT tool. Specifically, the study addressed how teacher candidates experienced posing free, semi-structured, and structured problems and how these experiences differed between a traditional pen-and-paper environment and the use of ChatGPT. In line with this main research problem, the study sought to answer sub-problems concerning teacher candidates' views on (a) their problem-posing experiences in a pen-and-paper environment, (b) their problem-posing experiences using ChatGPT, and (c) the perceived differences between these two environments across the three problem types. Data were collected using a Post Application Interview Form, and the obtained data were analyzed through thematic analysis and content analysis.

3.1. Research Model

In the study, teacher candidates were asked to pose five problems of three different types: free (unstructured), semi-structured (posing problems appropriate to the outcome/unit, posing problems appropriate to the process, posing problems appropriate to the problem statement),

and structured. Candidates were asked to first pose these problems in a classroom setting using pen and paper and then using ChatGPT. The researchers investigated the advantages and disadvantages of the problems posed with pen and paper and ChatGPT, which type of problem posing the candidates found difficult, whether they would like to use ChatGPT in their professional lives in the future, and whether they would recommend ChatGPT to mathematics teachers for problem posing activities.

3.2. Participants

The study group consisted of 13 teacher candidates, nine women and four men, enrolled in the Primary Mathematics Education Bachelor's Program at the Faculty of Education of, Eskişehir Osmangazi University, during the fall semester of the 2024-2025 academic year, who were taking the compulsory course of Mathematics Problem Solving (A). The participants were coded as TC1, TC2, TC3... etc. respectively for anonymity.

3.3. Data Collection Tools

This study contains 13 questions regarding the content of the questions found in the post-application interview form used as a data collection tool, the types of problems they struggled to construct, the advantages and disadvantages of the problems they constructed in the ChatGPT and paper-and-pencil environments, whether they would recommend ChatGPT to mathematics teachers in problem-construction activities, and whether they would use ChatGPT in their future careers. This study is a case study, one of the qualitative research methods, based on the data obtained from the Post-Application Interview Form conducted after the problem-setting activity with ChatGPT, one of the GAI tools, by primary school mathematics teacher candidates. A case study is a research method in which the researcher limits the circumstances of one or more events by using data collection tools such as documents, interviews, and observations (Creswell, 2007). The Post-Application Interview Form used as the data collection tool in this study was developed by the researchers in line with the research objectives and relevant literature on problem posing and technology use in mathematics education. During the development process, an initial pool of interview questions was created to capture teacher candidates' experiences, perceptions, and evaluations of problem posing in both pen-and-paper and ChatGPT-supported environments. To ensure content validity and clarity, the draft interview form was reviewed by two experts in mathematics education and one expert in educational measurement and evaluation. Based on the feedback received, some questions were revised for clarity, and overlapping or ambiguous items were removed. Following expert review, a pilot interview was conducted with two primary school mathematics teacher candidates who were not included in the main study sample. The pilot application helped determine the comprehensibility of the questions and the approximate duration of the interviews. The final interview form consisted of 13 open-ended questions and was administered after the completion of the problem-posing activities.

3.4. Data Analysis

Thematic analysis and content analysis were used in the analysis of the data. Content analysis is defined as a repeatable method that divides the text into smaller categories according to

certain rules, particularly for analyzing data obtained from interviews conducted in the social sciences (Büyüköztürk et al., 2023, pp. 258-259). Content analysis involves creating a system to record specific aspects of the material set and its content to be analyzed. This system examines the frequency of use of specific themes and words. Findings obtained in this way are systematically analyzed using tables or graphs. Therefore, content analysis is performed by systematically examining the data (Lawrence, 2014). One type of content analysis, thematic analysis, enables the synthesis and interpretation of data, the comparison of similar or different aspects of the results obtained, and the organization of studies into themes (Çalık & Sözbilir, 2014).

4. FINDINGS

The End-of-Application Interview Form was used to gather teacher candidates' opinions on their problem-posing experiences. Findings from teacher candidates' responses to the question, “Do you feel competent in posing problems in a paper-and-pencil environment? Explain why,” are presented in Table 1.

Table 1. *Teacher Candidates' Feelings of Competence in the Paper-Pencil Environment*

Competence	Reason	Teacher Candidate Codes
Yes	Having received formal instruction	TC4, TC39
	Extensive problem-posing experience	TC4, TC29
	Academic knowledge	TC10, TC29, TC46
	Having encountered different types of problems	TC11
	Experience	TC11
	Problem posing with pen and paper is concrete	TC24
	Having mathematical modeling and reasoning skills	TC30
Partially	Independent problem-posing practice	TC10
	Having trouble writing original questions	TC15, TC16
	Difficulty posing problems	TC12
No	Gaining more experience	TC7, TC13
	Feeling inadequate	TC8

Table 1 shows that a higher proportion of teacher candidates feel competent in problem-posing in a paper-and-pencil environment. This competence stems from the fact that the candidates have taken a problem-posing course, have experience in the subject, possess academic knowledge, have encountered different types of problems, the concreteness of the paper-and-pencil environment, and possess mathematical modeling and reasoning skills. Some examples from these candidates' statements are provided below:

TC4: “Yes, I feel that way because I took a course on this subject and posed many problems.”

TC11: “Yes, because we encountered questions related to many types of problems during our student life. This led to experience. I think this enabled us to reach competence.”

TC29: "Yes, I feel it. Thanks to the academic knowledge I have acquired throughout my 4 years of education, my interest in this field and the knowledge of my professors, we have conducted different studies in this field and have done many problem-posing activities. Therefore, I can honestly say that I feel competent in problem-posing."

TC39: "Yes, I feel competent because we posed and solved problems in a paper-and-pencil environment within the scope of the problem-solving course in mathematics."

The findings obtained from the responses to the question, "What was the most difficult thing for you in your first task (the task of posing a problem in a paper-and-pencil environment without using any resources)? Please explain." are given in Table 2.

Table 2. *Situations Where Teacher Candidates Experience Difficulties in the Paper-Pencil Environment*

Challenging Subject	Teacher Candidate Codes
Lack of a clear framework	TC8
Determining the difficulty level and type of the problem	TC4
Formulating a complete problem	TC4
Avoiding unnecessary expressions	TC4
Writing questions related to real life	TC12, TC15, TC16
Originality	TC29
Posing interesting problems	TC24, TC29
Topic selection	TC11
Appropriateness to grade level	TC11, TC30
Suitability to student level	TC13, TC24, TC46
Determining the difficulty level of the problem	TC15, TC39
Generating ideas	TC24
Establishing connections between problem situations	TC7
Placing numbers appropriately	TC7
Constructing a logical problem scenario	TC39
Thinking about solution steps	TC10

Table 2 shows that the most challenging aspects of the paper-and-pencil problem-posing task for teacher candidates were writing questions related to real life and appropriate to the student's level. Some examples from these candidates' statements are given below:

TC12: "It was challenging for me to ensure that the problem was in a meaningful context from daily life."

TC13: "While trying to improve the quality of the questions, I realized I was writing complex ones. It was challenging for me to think that the student should reach a clear conclusion when read, yet be open to interpretation, and to write problems that fit this structure. I had to constantly revise the problem with an eraser in hand. I also realized that posing a problem is more difficult than solving it because when posing a problem, you have to think of more than one solution at a time."

The findings obtained from the responses to the question, "Which type of free, structured, and semi-structured problem posing task did you have the most difficulty with? Which type was

the easiest to prepare? Explain why?" are given in Table 3.

Table 3. *What Kinds of Difficulties Do Teacher Candidates' Experience in Problem Posing?*

Difficulty	Problem Types	Reason	Teacher Candidate Codes
The hardest	Free Problem Posing	Lack of a clear framework	TC8, TC24
		No restrictions	TC4, TC29
		Determining the content of the problem	TC4, TC10
		Determining the subject of the problem	TC4, TC29, TC39
		Determining suitability for grade level	TC4, TC39
		No redirection	TC16, TC30
		Using creativity (imagination)	TC10, TC12, TC15
		Solution to the problem	TC10, TC39
	Unspecified	TC7	
	Semi-Structured Problem Posing	Having certain information	TC46
Expressions containing operations or words create difficulty in a unique new problem		TC13	
Structured Problem Posing	Restriction of the mind	TC13	
	Compliance with certain rules	TC11	
	Using creativity	TC11	
Structured Problem Posing	Forming a mathematical expression	TC11	
	Free Problem Posing	Being free	TC11, TC13
	Free Problem Posing	Establishing any problems	TC46
The Easiest	Semi-Structured Problem Posing	Having both clues and the ability to change by adding things	TC15
		Having certain boundaries makes it easier	TC24
	Problem-posing based on the information given	TC30	
	Structured Problem Posing	Having a certain framework (limit)	TC8, TC10, TC39
		Having an example problem	TC4
Having data		TC29	
Having guiding elements		TC12	
Structured Problem Posing	Unspecified	TC7, TC16	

Table 3 shows that free problem posing is the most difficult, while structured problem posing is the easiest. The reasons candidates considered the free problem posing type the most difficult

were the lack of a specific framework, determining the content of the problem, determining the grade level, using creativity, and determining the solution. The reasons why structured problem-posing was chosen as the easiest were the presence of a specific framework, the presence of a sample problem, the presence of data, and guiding elements. Some examples from the candidates' statements are provided below:

TC4: "Actually, I didn't have much difficulty with any type of problem, but even though there were no restrictions when posing free problems, it was time-consuming to determine the content, topic, and suitability of the problem to the grade level and then pose a new problem. For this reason, I can say that I had a little difficulty posing free problems. The easiest type to prepare was structured problem posing. Because posing a problem similar to a ready-made problem took much less time."

TC10: "I had more difficulty in the free problem posing task than the others because the formulation of the problem, the variety of solution methods, and the active use of creative thinking skills made it challenging. The easiest one was, of course, the structured problem posing task because all the steps were almost clear."

TC12: "I had the most difficulty with the free type because I had to use my own creativity completely. The easiest one was the structured one because there were guiding elements."

TC24: "I think the hardest part is free. Because it's a vast field. It gets harder to find the right one. The easiest part is posing a semi-structured problem. Because the structured one is also in a very narrow field, making movement difficult and giving the impression of copy-paste. Semi-structured problems provide conveniences at a level with more appropriate boundaries."

The findings obtained from the responses to the question, "What was the most challenging for you in your second task (problem posing task using ChatGPT)? Please explain." are given in Table 4.

Table 4. Situations in which Teacher Candidates Have Difficulty Posing Problems in ChatGPT

Difficulty level	Reason	Teacher Candidate Codes
I had a hard time	Original problem writing	TC16
	Progressive problem writing	TC16
	Writing a prompt	TC7, TC24, TC29
	Providing correct guidance	TC12
	Incomplete or excessive feedback	TC46
	Not fully understanding how to use ChatGPT	TC7
I had some difficulty	Choosing the appropriate problem	TC4
	Give detailed commands to get good results	TC13
I didn't experience any difficulties	Previously used	TC11
	Giving numerical data and subject	TC15
	Providing correct guidance	TC30, TC39
	Living on technology	TC8
	Unspecified	TC10

Table 4 shows that a higher proportion of teacher candidates experienced difficulty with the ChatGPT problem-posing task. The most common reason for difficulty was writing commands. Following those who experienced difficulties, those who did not were second only to those who did. Some examples from these candidates' statements are provided below:

TC7: "I didn't know exactly how to use Chatgpt. How to give it commands. I had a hard time with that."

TC24: "ChatGPT did not correctly recognize any of my commands during my activity, so it was not productive. Therefore, it was a completely challenging process."

TC15: "Frankly, I didn't have much difficulty. Sometimes providing numerical data was enough. When I gave the topic, the student was able to pose fluent problems. I could include either a single outcome or different outcomes in the question. As I used GPT, I started to have a more positive perspective on writing problems."

TC30: "There was nothing challenging. I was able to achieve the problem I wanted by directing ChatGPT correctly."

The findings obtained from the responses to the question, "Which type of problem posing task did you have the most difficulty with using ChatGPT in free, structured, and semi-structured problem posing? Which type was the easiest to prepare? Explain why?" are presented in Table 5.

Table 5. *What Kind of Difficulty Do Teacher Candidates Have in Posing Problems in ChatGPT?*

Difficulty	Problem Types	Reason	Teacher Candidate Codes
The hardest	Free Problem Posing	Determining suitability for student level	TC4
		Selecting problems appropriate to the curriculum	TC4
		Determining how to begin the problem	TC16
		Difficulty directing artificial intelligence	TC16
		Determining suitability for the grade level	TC15
		Failure to perceive commands	TC24
		Stages of posing the problem	TC10
		Problem solving stages	TC10
	Semi-Structured Problem Posing	Finding a topic	TC7
		Finding the appropriate instruction	TC39
		Having certain information	TC8
		Redirection is necessary	TC12
		Being original	TC12
		Making constant corrections	TC46
Structured Problem Posing	Failure to perceive commands	TC24	
	Having a certain problem	TC8, TC13	
	Making a referral	TC29, TC30	
	Difficulty in writing the desired problem	TC11	
The Easiest	Free Problem Posing	Failure to perceive commands	TC24
		Getting a result with the write problem command	TC8, TC29
		Fast problem setting as there are no limitations	TC13
	Semi-structured Problem Posing	Unspecified	TC30
		Guidance in line with the information provided	TC16
	Structured Problem Posing	Making small changes	TC4
		When you clearly express what you want, you get the result you want.	TC15
		Easy preparation of instructions with clear boundaries	TC39
		Unspecified	TC7, TC12

Table 5 shows that using ChatGPT, the most difficult problem-posing task was free problem-posing, while the easiest was structured. Reasons for selecting the free problem-posing type as the most difficult included determining student level suitability, selecting problems appropriate to the curriculum, determining how to begin the problem, difficulty directing the artificial

intelligence, and determining the problem-posing and solution steps. The reasons for selecting the structured problem-posing type as the easiest were that they achieved the desired result by clearly expressing their desire to make certain minor changes, and that preparing instructions was easier with clear boundaries. Some examples from these candidates' statements are provided below:

TC4: "Although there were many problem suggestions when posing free problems, it was time-consuming to choose the ones that were appropriate for the student level and the curriculum. Therefore, I can say that I had a little difficulty. The easiest one was posing a structured problem because small changes were made."

TC15: "The easiest one was posing a structured problem. When I entered the explanation correctly and explained what I wanted clearly, I got the result I wanted. I had a hard time with the free problem because sometimes I wanted distractors in the question, and he placed them in unnecessary places, or he gave a problem that was too complex for the level I wanted. He designed problems that included learning outcomes for upper grades. For example, I asked him to write a problem for fifth grade. When he overlooked the ChatGPT curriculum, he included a small topic for seventh grade in the problem he posed."

TC16: "I had the most difficulty posing a free problem and the least difficulty posing a semi-structured problem. Since the topic in the free problem was entirely my own, I had difficulty determining where to start and directing the artificial intelligence. However, in the semi-structured problem, guidance was easy based on the information provided."

TC39: "I can say that it was a free problem-posing type. Writing the appropriate instructions was more difficult than other problem types. The easiest type to prepare was the structured problem-posing task because the boundaries were clear, so I prepared the instructions using the given boundaries."

The findings obtained from the responses to the question, "What do you think are the advantages of posing problems using ChatGPT? Please explain." are given in Table 6.

Table 6. *Advantages of Posing Problems in ChatGPT by Teacher Candidates*

Advantage	Reason	Teacher Candidate Codes
There is	Saving time	TC4, TC7, TC11, TC12, TC13, TC15, TC16, TC39
	Posing the most logical and useful problem in the face of possibilities	TC8, TC13
	Offering different perspectives	TC7, TC12, TC16
	Getting results without getting tired	TC11, TC29
	Supporting creativity and improving thinking skills	TC10, TC12
	Quick problem setting	TC46
	Question diversity	TC10, TC15
	Quick thinking (getting results)	TC13, TC15
	Finding different solutions quickly	TC7, TC10, TC15
	Quick revision (edit)	TC13
	Filtering based on the given command	TC7
None	It's no use	TC24, TC30

Table 6 shows that posing problems using ChatGPT offers many advantages. Only two teacher

candidates (TC24, TC30) stated that ChatGPT has no advantages. The biggest advantage of ChatGPT was that it saves time. Some examples from these candidates' statements are provided below:

TC12: "It saves time, offers different perspectives, and supports creativity."

TC15: "A lot of alternative problems have emerged. It is very useful in terms of the variety of questions. Considering that he has access to other resources, he can pose different types of problems. It is also very useful when time is limited. He thinks faster than you think. He finds different solutions faster, too."

The findings obtained from the evaluation of the answers to the question "What do you think are the disadvantages of posing problems using ChatGPT? Please explain." are given in Table 7.

Table 7. Disadvantages of Posing Problems in ChatGPT by Teacher Candidates

Disadvantage	Reason	Teacher Candidate Codes
There is	Inappropriateness to grade level	TC4, TC15, TC46
	Incomplete or incorrect problem preparation	TC4, TC46
	Getting used to prep work and dulling creativity	TC4, TC11
	Reduced thinking ability	TC8, TC10, TC16, TC39
	Automatic content is superficial or complex	TC12, TC16
	Having limited creativity	TC29
	Chatting with ChatGPT causes 500 ml of water to be reduced	TC29
	Having a perception problem	TC24
	Obligation to provide guidance and make corrections where necessary	TC7, TC13, TC30, TC39
	None	-

Table 7 shows that the disadvantages of problem-posing using ChatGPT are at least as numerous as its advantages. The most significant disadvantages of ChatGPT were found to be the reduction in thinking skills and the necessity of providing guidance and correction when necessary. Some examples from the candidates' statements are provided below:

TC10: "I don't think it will have much of a disadvantage, but maybe it can cause laziness in the person's thinking skills in the long run, since you are making it very easy for the person."

TC13: "If you try to use the answers you receive without checking and revising them, you could run into serious problems. I think AI is a great assistant, but if you leave your work entirely to it, you'll clearly regret it. We have to pay attention to guidance and make corrections where necessary."

The findings obtained from the responses to the question "Can you make a general evaluation of your experience of posing problems using ChatGPT?" are given in Table 8.

Table 8. *General Evaluation of Teachers Candidates' Problem Posing Experiences in ChatGPT.*

Level	Reason	Teacher Candidate Codes
Positive	Posing a wide variety of problems	TC4, TC11, TC13
	Being a simple application	TC8
	It is useful and instructive	TC7, TC10, TC12, TC16
	Provides quick turnaround	TC11, TC15, TC46
	Being creative	TC15
	Providing different perspectives	TC13
	Being able to pose the problem he wants	TC30
	Developing thinking skills	TC10
Negative	Saving time	TC39
	Re-examination of the answers given	TC46
	Having a bad experience	TC24
	Consideration of needing improvement	TC29

Table 8 shows that teacher candidates' evaluations of their experience with problem-posing using ChatGPT were largely positive. The primary reasons for this positive assessment were its usefulness and instruction. Some examples from these candidates' statements are provided below:

TC12: "Overall, it was a useful and educational experience. It showed me different paths."

TC16: "It was generally useful and educational. However, the outputs must be checked and made compatible with the teaching objectives."

The findings obtained from the responses to the question "Would you consider using ChatGPT to pose problems in your profession in the future? Explain why." are given in Table 9.

Table 9. *Whether Teacher Candidates Consider Using ChatGPT for Problem Posing in Their Future Professions*

Reply	Reason	Teacher Candidate Codes
I think	Saving time	TC4, TC12, TC15, TC16, TC39
	Provides the ability to pose various problems	TC4, TC16
	Getting help with creativity/originality	TC15, TC29
	Helping to generate new ideas	TC10, TC12, TC15
	Providing convenience	TC7, TC11, TC15, TC46
	Providing diversity	TC11
	Helping technology integration	TC13, TC46
I think partly	Having more options	TC8
I don't think	Inefficient	TC24
	Having the right to ask limited questions	TC30
	Making an effort	TC30

Table 9 shows that a high number of candidates plan to use ChatGPT to solve problems in their future professional lives. The primary reason candidates want to use ChatGPT is its convenience. Some examples from these candidates' statements are provided below:

TC7: "Yes, I am thinking of using Chatgpt in my professional life. I think it will make things much easier for me."

TC46: "Yes, it will make my job easier and I think it will help me pose technology-supported problems."

The findings obtained from the responses to the question, "Would you consider using ChatGPT in your future profession to see the solutions to the problems you posed? Explain why?" are given in Table 10.

Table 10. *Whether Teacher Candidates Consider Using ChatGPT to Solve Problems in Their Future Professions*

Reply	Reason	Teacher Candidate Codes
Yes	Wanting to see different solutions	TC4, TC8, TC11, TC12, TC15, TC29, TC39
	Used for control purposes	TC7, TC12, TC16
	Providing a different perspective	TC10, TC11, TC15
	Providing an environment for discussion on solutions	TC30
Partially	To be used when deemed necessary	TC46
	Failure to obtain productive answers	TC13
No	Not producing correct answers	TC24

Table 10 shows that a high number of teacher candidates consider using ChatGPT to find solutions to problems in their future professional lives. It was found that the primary reason candidates want to use ChatGPT to solve problems is to see different solutions. Some examples from these candidates' statements are provided below:

TC4: "Yes, in some cases, I may consider having different solutions solved, but in general, I prefer to solve the problems I have posed myself."

TC11: "Of course, it could be to see different solutions and to provide a different perspective."

The findings, based on the responses to the question, "Do you recommend mathematics teachers to use ChatGPT in problem-posing activities? Explain why?", are given in Table 11.

Table 11. *Whether Teacher Candidates Recommend ChatGPT to Mathematics Teachers*

Reply	Reason	Teacher Codes	Candidate
I recommend it	The problem is that diversity improves perspective	TC4	
	Saving time	TC4, TC11, TC15, TC16	
	Generates various types of problems	TC7, TC11, TC15, TC16	
	Creating a different perspective	TC10, TC15, TC29	
	Used to find ideas	TC12	
	The importance of using artificial intelligence	TC13	
	Developing creative thinking skills	TC10	
I partially recommend it	Providing convenience	TC7	
	The benefit of producing new things oneself	TC8, TC39	
	Getting used to easy	TC30, TC39	
I don't recommend it	Checking	TC39	
	The answer is wrong or missing or redundant	TC46	
	Making work difficult	TC24	

Table 11 shows that a high number of candidates recommended that mathematics teachers use ChatGPT in problem-posing activities. The time-saving nature and the ability to generate a variety of problem types were considered crucial in this regard. Some examples from these candidates' statements are provided below:

TC4: "Yes, because the diversity of problems can broaden their perspectives. They can also have the problems they want posed in a short time."

TC7: "Yes, I recommend it. I think it will provide them with a lot of convenience and variety."

The findings obtained from the responses to the question, "For what purpose(s) do you think ChatGPT can be used in your profession? Please list them." are given in Table 12.

Table 12. *For What Purposes Teacher Candidates Want to Use ChatGPT in Their Profession*

Purpose	Teacher Candidate Codes
Generating an event	TC4, TC11, TC12, TC13, TC16, TC46
Posing problems	TC4, TC7, TC8, TC10, TC12, TC13, TC15, TC16, TC39
Receiving material suggestions for use in classes	TC4, TC8, TC39
Generating a game	TC4, TC29
Receiving suggestions on teaching techniques	TC4, TC13, TC29
Exam preparation	TC8, TC11
Exam reading (evaluation)	TC8, TC15
Preparing a lesson plan	TC11, TC12, TC15, TC16, TC39
Problem solving	TC7, TC30, TC39
Checking solutions to problems	TC12
Checking homework	TC15
Doing research	TC13
Scanning various sources	TC10, TC13
Getting an opinion on any topic	TC10, TC30
Gaining different perspectives	TC10, TC30
Offering different solutions	TC10

Table 12 shows that the most common problems encountered by teacher candidates in their professions using ChatGPT are:

TC7: "It can be used for many applications such as problem posing, problem solving, subject explanation, filtering data, etc."

TC10: "Posting problems, offering different solutions, creative ideas, gaining information..."

The findings obtained from the responses to the question, " What do you think are the appropriate artificial intelligence tools for posing problems, other than ChatGPT? List them. What are the strengths and weaknesses of these tools? Explain. " are given in Table 13.

Table 13. *Artificial Intelligence Tools Other Than ChatGPT Suitable for Problem Posing*

Artificial Intelligence Tool	Strengths	Weaknesses	Teacher Candidate Codes
Canva	Making learning effective by forming visuals	Inadequate for all mathematics subjects	TC4
	Helping with content creation	It is a bit difficult to use for a beginner and some parts are paid.	TC46
Bing AI	Writing questions for students	The results are not always accurate	TC16
	-	Being slow	TC15
Google Bard and Copilot	Providing quick solutions	Sometimes gives wrong or superficial answers	TC12
Dall-e	Being successful in terms of visual formation	-	TC15
Gemini, Copilot, Bing	Receiving very fast answers and performing a wide range of scans within seconds	The answers are not at a very good level when the commands are not given in detail.	TC13
Gemini	Up-to-date information and Google integration	Superficial productions	TC10
	Works mostly correctly when instructions are clear	-	TC39
MagicSchool	Having many different tools makes it easier for teachers to generate questions and prepare lesson plans.	Some parts are paid	TC39
Non-AI tool (Geogebra)	Making appropriate designs for geometry lessons	There is no sufficient application for all mathematics subjects.	TC4
Those who do not use artificial intelligence tools other than ChatGPT	-	-	TC7, TC8, TC29

Table 13 shows that teacher candidates used the AI tools Gemini, Canva, Bin AI, Google Bard, Copilot, Dall-e, and MagicSchool. Three teacher candidates (TC7, TC8, TC29) were found to have used no AI tools other than ChatGPT. The conclusions drawn from the research findings

and their comparison with the literature are presented in the following section.

5. RESULTS AND DISCUSSION

In line with the results obtained from the research, when the findings regarding the teacher candidates' desire to use the ChatGPT GAI tool in their future professions were examined, it was concluded that some wanted to use it for occasional help, to save time, and for creativity. Similar to the results of this research in the literature, a study by Murtezaoğlu and Birol (2025) stated that ChatGPT, despite some negative aspects, provided students with a new perspective and that its use had positive results in terms of students' acquisition of knowledge and the development of teaching strategies. In another similar study, Tapan-BROUTIN (2023) concluded that a process began when teacher candidates incorporated ChatGPT into the education and training process. In their study, Serin and Kepçeoğlu (2025) concluded that ChatGPT played a role in encouraging creativity-oriented teacher education.

According to the findings of the study, when posing problems in a paper-and-pencil environment, teacher candidates struggled with organizing the sequence of events, working without a clear framework, ensuring appropriateness to students' level, and posing real-life-related problems. Furthermore, participants were observed to use erasers extensively during this process. Biton and Segal (2025) found a similar finding in their study, concluding that demonstrating the relevance of problems to daily life and identifying students' potential difficulties is crucial.

The findings show that posing problems using ChatGPT offers advantages such as numbers and stories, saving time, and providing a different perspective are advantages. Similarly, in their study, Kim, Park, and Young (2025) concluded that problem-posing experiences with ChatGPT are advantageous in terms of receiving rapid feedback, having variety (different types of problems), and various solution strategies (analyzing from different perspectives).

ChatGPT has disadvantages such as not being sure that it poses an original problem, checking the accuracy of the problem, facilitating instructional processes reducing teachers' workload, reducing the individual's thinking skills, and not being understandable and appropriate for the students, which is similar to the results of this study. In their study, it was concluded that ChatGPT has to be checked because it makes mistakes.

6. RECOMMENDATIONS

Future studies may employ quantitative or mixed-method designs to examine AI-supported problem-posing processes and compare groups with and without ChatGPT use. The impact of prompt quality on the originality, mathematical accuracy, and cognitive level of generated problems may also be investigated. In addition, future research may focus on the ethical dimensions of AI use, the risk of overreliance on such tools, and the integration of AI-supported problem-posing activities into teacher education programs. Comparative studies involving in-service teachers as well as middle and high school students may further contribute to understanding the pedagogical implications of AI-supported problem posing.

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