Is ChatGPT a Good Middle School Teacher? An Exploration of its Role in Instructional Design

Yingzhe Li [1] , Jianling Liu [2*] and Shichen Yang [3]

email address[1]:dazhe0506@yeah.net,
email address[2*](corresponding author):jianling1026@yeah.net,
email address[3]:tomyang030608@outlook.com

Affiliation, contact address of the three authors:Child Development and Education Research Center, South China Normal University, Guangzhou, Guangdong, 510006, China

Abstract: Instructional design's origins lie in the philosophies of American educators like Dewey and Bloom, arranging education coherently with learner traits and standards. ChatGPT, an AI tool by OpenAI, employs neural networks for text processing and human-like interactions. Its potential in education, especially in generating materials, captivates educators. This study explores if ChatGPT can replace human teachers in creating lesson plans. Classes from 8th-grade math and 9th-grade English were used, with human teachers and ChatGPT 3.5, 4.0 designing five plans each. Evaluation followed China's Youth Teachers' Competition and plan guidelines, assessing objectives, content, process, methods, and innovation. 10 experts, English and math, anonymously rated plans using a scale, yielding insights.

Keywords: ChatGPT, Instructional Design, Empirical Study

1 Introduction

ChatGPT [1] is an AI-powered natural language processing tool developed by the American artificial intelligence research lab OpenAI. It uses the Transformer neural network architecture and possesses language comprehension and text generation abilities [2]. In particular, it trains the model by connecting a vast amount of textual data, including real- world conversations, enabling ChatGPT to possess knowledge spanning a wide range of topics. Additionally, it can interact based on contextual cues, simulating human-like conversations. ChatGPT is not only a chatbot but also capable of tasks such as composing emails, video scripts, copywriting, translation, coding, and more. The potential role of ChatGPTin education has garnered attention, including whether it can assist with teaching design and generate educational materials. This study primarily focuses on whether it can replace human teachers in generating instructional design documents.

Teaching design is the most basic ability of a teacher. The conceptual philosophy of instructional design was initially reflected in the educational ideas of American educator John Dewey [3]. American educator Benjamin Bloom further reinforced this concept and systematically classified educational objectives [4]. Instructional design involves arranging instructional elements in an orderly manner based on the requirements of curriculum standards and the characteristics of learners, determining envisioned and planned suitable teaching

NMDME 2023, October 13-15, Xi'an, People's Republic of China

DOI 10.4108/eai.13-10-2023.2341343

strategies [5]. It generally includes elements such as instructional objectives, key teaching points, teaching methods, teaching steps, and time allocation. Instructional design is a holistic, scientific, and systematic process in which teachers, based on their analysis of students and teaching tasks, design teaching objectives, teaching methods, teaching materials, teaching progress, and curriculum assessment [6,7].

A lesson plan is the textual manifestation of instructional design. The preparation of a lesson plan encapsulates a teacher's rich design ideas and practical wisdom. It's one of the important ways to showcase a teacher's teaching design capabilities and plays a significant role in promoting effective teaching and professional development.

Hence, we selected one class each from the eighth-grade mathematics and ninth-grade English, two different subjects. We tasked human teachers, ChatGPT 3.5, and ChatGPT 4.0 with designing lesson plans. Ultimately, five lesson plans were generated for each subject. Based on the fundamental requirements of instructional design and teaching capabilities, we employed evaluation criteria from the "Teaching Design" segment of the China National Youth Teachers' Competition and the grading guidelines for outstanding lesson plans in primary and secondary schools. Evaluation was conducted across five aspects: instructional objective design, instructional content design, instructional process design, teaching method design, and normativity and innovation. After anonymizing the lesson plans, 10 experts in the fields of English and mathematics, including frontline senior teachers and university scholars, were invited to evaluate and score them. The scoring was carried out using a level scale, where full compliance with requirements scored 7 points and complete non-compliance scored 1 point. As show at Tables 1and 2, The final score for each indicator of the lesson plans was determined by the average score. And the manual prompting for ChatGPT are as shown at Table 3.

Table 1. Comparison of ChatGPT and Human Teachers in Instructional Design (8th Grade Math)

Evaluation Indicator	Human	**GPT3.5**		**GPT4.0**	
		Original	**Enhanced**	**Original**	**Enhanced**
Teaching Objectives Design	6.00	3.89	4.67	3.67	4.44
Content Design	6.33	1.89	2.67	2.56	3.00
Teaching Method Design	6.33	2.22	4.56	3.33	5.28
Teaching Process Design	7.00	3.67	4.67	3.67	4.56
Normativity and Innovation	5.67	1.67	1.89	1.67	2.67

Table 2. Comparison of ChatGPT and Human Teachers in Instructional Design (9th Grade English)

Evaluation Indicator	Human	**GPT3.5**		**GPT4.0**	
		Original	**Enhanced**	**Original**	**Enhanced**
Teaching Objectives Design	6.92	3.48	4.27	3.97	4.49
Content Design	6.33	2.58	2.97	1.92	2.48
Teaching Method Design	7.00	3.25	3.81	3.45	3.61
Teaching Process Design	6.83	4.46	4.61	4.90	4.98
Normativity and Innovation	6.33	2.67	3.33	3.33	3.67

Table 3. The Manual Prompting for ChatGPT

Writing Prompt	You are a professional in the field of education, possessing extensive teaching experience and specialized subject knowledge. You have the ability to integrate educational theory with practice, create instructive and actionable lesson plans to promote effective student learning. The following content is the teaching material: [Teaching Material] Please write a lesson plan.
Enhance Prompt	You are a professional in the field of education, possessing extensive teaching experience and specialized subject knowledge. You have the ability to integrate educational theory with practice, create instructive and actionable lesson plans to promote effective student learning. The following content is the teaching material: [Teaching Material] I hope you can help me improve the following lesson plan: [Current Lesson Plan]

2 Teaching Objective Design

Teaching objectives refer to the description of the expected outcomes or standards that students should achieve through teaching activities. They serve as guidance throughout the entire teaching process, providing teachers with direction for instructional activities and serving as the basis for evaluation. The objectives used to assess student learning are also the goals of student learning activities. With clearly defined teaching objectives, teachers can select teaching strategies, instructional media, design teaching models, and develop assessment plans to effectively implement teaching activities [8].

A complete teaching goal should be composed of four parts, namely the teaching object, the behavior of expressing learning results, the conditions for expressing behavior, and the degree of goal. Firstly, it is necessary to clarify the teaching object, that is, to indicate who the teaching objectives are proposed for. The target audience can be the entire class or some students. For example, "Every student should..." and "Students who are already able to recite the text should...". The second is to explain what knowledge should be acquired, what skills should be formed, and what behaviors should be generated after a course of study, which are the basic components of the goal. The target behavior should be observable and must be expressed using verbs that accurately and specifically describe the behavior. For example, "describing the characteristics of..." and "understanding the history of...". The third factor is the situational factors of learners' performance behavior, including environmental factors, human factors, equipment factors, information factors, time factors, problem clarity factors, etc. For example: "From specific examples...", "Through experiments...". The degree in the final teaching objectives indicates the target level of student performance, making the teaching objectives measurable. For example, 'At least able to answer correctly... ' .

Research has found that there is not much difference in teaching goal design between GPT3.5 and GPT4.0. As shown at Tables 4and 5, the original version of GPT4.0 outperforms the initial version of GPT3.5 in terms of goal expression. The improved teaching goal design can further supplement the goal behavior and goal level, resulting in higher scores than the

original version. However, the educational objectives formed by it all lack the element of teaching objects, which also leads to lower overall evaluation scores than human teachers.

Taking the design of English lesson plans for human teachers as an example: its teach- ing objects are clearly defined as all students; Conduct targeted actions such as analyzing and evaluating daily environmental protection measures for identified environmental issues; Organize information, verbal discussions, etc. as situational elements; Propose solutions and enhance environmental awareness as a clear goal level. The completeness of all elements is the reason why it can achieve a score of 6.92.

GPT generated lesson plans can reflect the design of teaching objectives, but the accuracy of teaching objectives is not enough. The teaching objectives proposed in the mathematics discipline lack behavioral actors, and the degree of objectives is difficult to observe and evaluate. Compared to English subjects, the teaching objectives proposed by GPT are relatively reasonable due to the more specific textual expression in the textbook content. However, when GPT is required to improve the generated lesson plans, there maybe situations of repeated narration, fiction, and illusion. For example, when GPT4.0 is required to improve the mathematical discipline objectives, it directly explains the brief objectives, which leads to understanding bias and equates commonly used concepts of logarithms and natural logarithms

Table 4. Comparison of Teaching Objective Design in Mathematics Between Human Teachers and ChatGPT in Four Dimensions [9]: 1. Teaching object 2. Behavior of expressing learning results 3.Conditions for expressing behavior 4. Goal level

Human Teacher (6.00)	1. Enable students to understand the history of the invention of logarithms, comprehend the definition of logarithms, and accurately apply symbols. 2. Help students become proficient in converting between exponential and logarithmic expressions and calculating logarithmic values based on the definition. 3. Foster students' understanding of transformation, analogy, induction, and the mathematical thought process of solving equations. Encourage independent thinking and enhance their ability to generalize abstract concepts.
GPT3.5 (3.89)	Understand the concept and definition of logarithms. Master the relationship between logarithms and exponents. Be capable of solving simple logarithmic operations.
GPT3.5 Improve (4.67)	Understand the concept and definition of logarithms. Master the relationship between logarithms and exponents. Be able to convert exponential expressions into logarithmic expressions and vice versa. Be capable of solving simple logarithmic operations.
GPT4.0 (3.67)	Understand and master the relationship between logarithms and exponents, able to apply this relationship to solve practical problems. Be able to calculate common logarithms and natural logarithms, and understand the practical applications of logarithms.
GPT4.0 Improve (4.44)	1. Understand and master the concept of logarithms: Logarithm is a mathematical operation that serves as the inverse of exponentiation. You should be able to calculate common logarithms (base 10) denoted as lgN and natural logarithms (base, approximately equal to 2.71828) denoted as lnN. 2. Be able to solve real-world problems: Logarithms have numerous practical applications in everyday life, such as calculating compound interest, population growth, microbial reproduction, and more. You should be capable of applying the theoretical knowledge of logarithms to solve practical problems and enhance your problems solving skills...

directly with logarithms. There is a similar problem in the English subject, where GPT4.0 can assume some words as learning points on its own, and only expands the number of words when required to be improved. Although the English lesson plan generated by GPT4.0 has four elements, there are deviations in the specific content selection, which affects the accuracy of the objectives. In the end, only 3.97and 4.49 points were obtained. GPT can imitate humans to propose teaching objectives, but cannot simulate the real teaching situation, so it cannot propose clear educational objects and educational behavior scenarios. GTP only focuses on the dimension of the degree of completion of knowledge and skills goals, and cannot understand the meaning of teaching objectives. It is difficult to propose truly meaningful teaching objectives, resulting in all scores below 5.0.

Table 5. Comparison of Teaching Objective Design in English Between Human Teachers and ChatGPT in Four Dimensions [9]: 1. Teaching object 2. Behavior of expressing learning results 3. Conditions for expressing behavior 4. Goal level

Human Teacher (6.92)	At the conclusion of this lesson, students will be able to: 1. Extract and summarize the environmental issues identified by Jim's family from the text. 2. Verbally discuss Jim's family's efforts to protect the environment in their daily lives based on the summarized information. 3. Analyze and evaluate Jim's family's everyday environ- mental conservation measures and propose their own suggestions and measures for environmental protection. 4. Enhance their awareness of "caring for the environment and starting with small actions.
GPT3.5 (3.48)	Through reading, listening, and writing activities, students will be able to: 1. Under- stand and discuss the importance of environmental protection and energy conservation. 2. Describe and address environmental issues, as well as propose their own suggestions.
GPT3.5 Improve (4.27)	Through reading, listening, and writing activities, students will be able to: 1. Under- stand and discuss the importance of environmental protection and energy conservation. 2. Describe and address environmental issues, as well as propose their own suggestions. 3. Utilize the verb phrases they have learned to describe environmental conservation actions.
GPT4.0 (3.97)	1. Students can understand and apply key vocabulary, such as pollution, recycle, reuse, etc. 2. Comprehend the main idea and details of a text through reading. 3. Understand and apply environmental concepts and actions from the text through discussion and sharing. 4. Engage in pair work to conduct interviews on environmental topics, enhancing their oral communication skills.
GPT4.0 Improve (4.49)	1. Students can understand and use key vocabulary such as pollution, energy, factory, nature, planting trees, recycling, reusing, garbage, soil, taking action, water, etc. 2. Students can comprehend the importance of environmental protection and the specific methods for implementing it through reading. 3. Students can propose their own environmental suggestions and actions through dialogue and discussion. 4. Students can enhance their listening comprehension skills on environmental topics through listening exercises. 5. Students can express their views and suggestions on environmental protection through writing exercises.

3 Content Design

Teaching content serves as the carrier and foundation for achieving teaching objectives and is the basis for collaborative activities between teachers and students. This mainly 87 includes the description of teaching content, integration of teaching content, analysis of 88 teaching key and difficult points, and other aspects.[8]Teaching content description and 89 integration refers to the ability of teachers to organize and accurately describe teaching content 90 based

on the current learning situation of students and the actual teaching situation. Make the 91 teaching content closer to students' cognitive habits on the basis of conforming to the logic of 92 the subject, and not limited to textbooks, allowing for independent addition of content that is 93 conducive to students' better mastery of knowledge and development abilities [10].

Table 6. Comparison of Content Design in Mathematics Between Human Teachers and ChatGPT in Three Dimensions: 1. Description of teaching content2. Analysis of important and difficult points in teaching 3. Processing of teaching content

Human Teacher (6.33)	This lesson is the first class of "Logarithms and Logarithmic Operations." The concept of logarithms is relatively abstract for high school students and can be challenging to learn. (1) Allow students to make concrete logarithmic statements and, through completing exercises, induce the steps of exponent-logarithm interchange, discovering the equivalent relationship between exponents and logarithms, and gaining a preliminary understanding of the definition. Using table completion and connecting lines, further understanding of the equivalence between exponents and logarithms is achieved. (2) Apply the definition to solve logarithmic value problems and summarize the solution methods, making students' knowledge skills-based. (3) Through calculations, make students focus on two important logarithms and draw three conclusions. Using the equivalence relationship between exponents and logarithms, students obtain the limiting conditions for a, x, and N in logarithmic expressions, achieving a refined definition and a deeper understanding of the concept. The entire teaching process incorporates mathematical thinking methods such as analogy, transformation, induction, and equation, cultivating abstract and generalizing abilities.
GPT3.5 (1.89)	(1) Concepts and definition of logarithms; (2) Relationship between logarithms and exponents; (3) Understanding and application of the relationship between logarithms and exponents.
GPT3.5 Improve (2.67)	(1) Concepts and definition of logarithms; (2) Relationship between logarithms and exponents; (3) Conversion of exponential expressions to logarithmic expressions, conversion of logarithmic expressions to exponential expressions; (4) Basic logarithmic operations. (1) Understanding the relationship between logarithms and exponents; (2) Conversion between logarithmic and exponential expressions.
GPT4.0 (2.56)	(1) Concepts of logarithms; (2) Relationship between logarithms and exponents; (3) Conversion of exponential expressions to logarithmic expressions; (4) Logarithmic calculations; (5) Applications of logarithms.
GPT4.0 Improve (3.00)	Understand and master the concept of logarithm: logarithm is a mathematical operation that is the inverse of exponential operation. Can calculate common logarithms and natural logarithms: common logarithms are logarithms based on 10, denoted as lgN; A natural logarithm is a logarithm based on the irrational number e (approximately 2.71828), denoted as lnN...

The analysis of key and difficult points in teaching is the top priority of curriculum design, even the central link of the entire curriculum design, and is also one of the essential elements for writing teaching plans. The teaching difficulty is the content that students find difficult to understand or comprehend. Be able to determine the key and difficult points of teaching based on teaching objectives, teaching development stages, and the position and role of knowledge in the subject. The key and difficult points can be emotions, attitudes, values, or more abstract, complex, and profound knowledge [11].

As shown in Tables 6 and 7, research has found that ChatGPT can extract teaching content from textbooks, but cannot clearly identify key and difficult points in teaching. The analysis of key and difficult points and the expression of goal design are repeated, and the overall gtp score of this indicator is below 3.5, which does not reach the median score.

Table 7. Comparison of Content Design in English Between Human Teachers and ChatGPT in Three Dimensions: 1. Description of teaching content 2. Analysis of important and difficult points in teaching 3. Processing of teaching content

Human Teacher (6.33)	This lesson is the 25-th lesson of Unit 9, "Save the Planet," titled "Going Green," which is a reading lesson discussing the main topic of "Environmental Protection." (1) Based on the information summarized, orally discuss Jim's family's efforts to protect the environment in their daily lives. (2) Analyze and evaluate Jim's family's daily environmental protection measures and discuss their own environmental protection measures. Enable students to master sentence patterns such as "So to help . . , our family has decided to . . ; because of all this, we decided to do. . . "Understand and use the present simple tense to discuss current environmental issues, use the present perfect tense simple past tense, and present simple tense to narrate the measures taken by Jim's family to address these issues.
GPT3.5 (2.58)	(1) Learn and use vocabulary and phrases related to environmental protection and energy conservation. (2) Read and understand articles about environmental protection.
GPT3.5 Improve (2.97)	(1) Learn and use vocabulary and phrases related to environmental protection and energy conservation. (2) Read and understand articles about environmental protection. (3) Apply learned knowledge for oral expression and writing.
GPT4.0 (1.97)	No analysis of teaching content and key/difficult parts.
GPT4.0 Improve (2.48)	Guide students to discuss environmental issues through pictures, and stimulate their interest and attention to environmental protection. Read and understand exercises to help students understand the importance of environmental protection and specific methods for implementing it. No real identification of key and difficult teaching points; primarily copies from the textbook or repeats descriptions of teaching objectives.

In terms of analyzing the key and difficult points of teaching, human teachers can determine the key and difficult points of teaching based on students' cognitive level, cognitive process, and cognitive rules, and according to teaching objectives and stages of teaching development. For example, mathematics teachers can start with the background of logarithm production and show students the reasons for the invention of logarithm in the form of pictures. Starting from two practical problems, they can propose two inverse problems for students to solve, making them feel the difficulty of solving, and thus realizing the necessity of introducing logarithm. The design of teaching content has a clear intention, clear logic, and interlocking elements. Although there are clear teaching content and key and difficult sectionsinGPT3.5 generated lesson plans, their content is vague, mostly listing textbook titles, and cannot capture the true teaching content. GPT4.0 generated lesson plans directly ignore the important section of teaching content analysis and teaching key and difficult analysis. It can be seen that there is a significant gap between GPT generated lesson plans and human teachers at this point, with Gpt3.5 and Gpt4.0 experiencing repetition, material constraints, and a lack of in-depth

argumentation when designing lesson plans. On the basis of further improvement requirements, there are still problems in the expression logic of teaching content such as the improved version of gtp3.5, which states "base is logarithmic base, exponent is logarithmic true number", and the expression content is difficult to understand.

4 Teaching Process Design

The design of the teaching process refers to the comprehensive arrangement of teaching activities by teachers in order to effectively impart knowledge and promote learning. It not only requires teachers to have a clear teaching perspective, but also the ability to design the entire teaching process using complex and dynamic thinking methods [12]. This is equally challenging for teachers. Therefore, both the teaching objectives and the overall design are important areas for teachers to enhance their educational wisdom and reflect their creativity in educational work.

As shown in Table 8, there are two main tasks that must be completed in teaching process design. Firstly, according to the basic logic of the teaching process, the specific stages and procedures of this lesson should be developed, and the time for each stage should be roughly allocated to outline the entire journey of this lesson. Secondly, based on the special relationship of synchronicity and interactivity between teacher and student activities in classroom teaching, in order to facilitate the generation and aggregation of classroom teaching resources, and to facilitate the goal advancement or adjustment of teaching to a more reasonable intention during the generation process, teachers should design activity content, methods, and organizational methods that are related but different between teachers and students at each stage. The selection should fully consider appropriateness, the pairwise nature of teacher and student activities and the inherent correlation and organic transformation between activities [13].

Table 8. The teaching process of GPT-4 at 8th Grade Math and 0th Gradelease English

Subject	The content of teaching process
Math	1. Introduction: Introduce the concept of logarithms by posing questions. 2. Explain the concept of logarithms, clarify the relationships between the base, the real number, and the logarithm, and define common logarithms and natural logarithms. 3. Use examples to illustrate the relationship between logarithms and exponents, guiding students to understand and grasp this relationship. 4. Use examples to explain how to convert exponential expressions into logarithmic expressions and vice versa. 5. Explain how to calculate common logarithms and natural logarithms, using examples to help students master the calculation methods. 6. Use real-life problems to help students understand and apply logarithms in practical situations. 7. Summarize the main content of this lesson and assign homework for after the class.

English	1. Reading Comprehension (20 minutes): Have students read Jim Barnes' article to understand how his family takes action to protect the environment. Ask students to identify environmental issues and solutions mentioned in the article, guiding them to understand the relationship between the problems and solutions. Have students discuss which actions taken by Jim's family are most effective in protecting the environment and encourage them to make their own suggestions. 2. Vocabulary Learning (15 minutes): Have students match verbs with vocabulary to form verb phrases, improving their vocabulary usage. Have students share what they have learned about environmental actions from Jim's family and guide them to use the newly acquired vocabulary. 3. Oral Practice (15 minutes): Pair students up for a simulated interview, discussing the major environmental issues we face and the actions we can take to protect the environment, enhancing their oral communication skills. 4. Summary (5 minutes): Have students summarize the knowledge and vocabulary they have learned about environmental protection in this lesson, reinforcing their learning outcomes. Encourage students to practice environmental actions in their daily lives to raise their environmental awareness.

In terms of the arrangement of the teaching process, GPT generated lesson plans can take into account the integrity of the teaching process, and can be well designed according to the five stages of psychological preparation, perception of knowledge, understanding of knowledge, consolidation of knowledge, and inspection and evaluation. However, there are many problems in time arrangement and interactive design. For the arrangement of teaching time, GPT does not have enough experience to allocate time like front line teachers, and more creative random allocation occurs, resulting in situations where the teaching stage time is the same and the total duration far exceeds the classroom requirements. In terms of teacher-student interaction, although the lesson plan mentions designing activities or conducting group discussions, there is not a lesson plan that truly designs interactive activities. GPT generated lesson plans are difficult to achieve interdisciplinary integration, mainly due to the capture of existing materials, which cannot be expanded. The original lesson plans generated by GPT3.5 and GPT4.0 did not have teaching time arrangements designed, while the improved lesson plans, although there are time arrangements, are mostly designed by GPT itself, which does not meet the requirements of the teaching curriculum. The math lesson plan generated by GPT3.5 has a time schedule of 70 minutes, and the English lesson plan generated by GPT4.0 has a time schedule of 100 minutes, the teaching duration of the improved lesson plan design is 110 minutes. The experiment found that after putting forward improvement requirements for GPT, the content of the lesson plan will significantly increase, but the content has not been optimized and instead becomes complex, vague, and unable to be analyzed in depth.

It indicates that GPT can play a role as a teacher in teaching process design to a certain extent, but unfortunately, it has not fully utilized its ability to collect and process data, expanding the content of the textbook. Many of the content is limited by the conceptual framework required by the lesson plan, generating a large number of formulaic language, which repeats before and after.

5 Teaching Method Design

Teaching methods are activities carried out during the teaching process to achieve educational objectives, deliver instructional content, and employ instructional means. They constitute a set of approaches guided by teaching principles, involving interactions between teachers and students. Teaching methods integrate educational goals and content and serve as a bridge for teacher-student activities [14]. Method "is constrained by" goals "and "content ", referring to how effective methods, means, and techniques should be adopted to achieve the goals. On the one hand, it refers to the sequence of operational actions, which is the "path to achieving a certain goal"; On the other hand, it refers to the narrow definition of "methods that lead to problem-solving in the context" [15].

As shown in Tables 9and 10, the improved teaching method design score of GPT4.0 is 5.28, which is higher than GPT3.5. GPT4.0 can better perform role transformation and identity simulation.

The design of teaching methods is reflected in the improved lesson plans of GPT3.5 and GPT4.0, which can mention basic teaching methods such as lecture method, practice method,

Table 9. Comparison between Human Teachers and ChatGPT in the Selection and Design of Mathematics Teaching Methods

Human Teacher (6.33)	Problem oriented teaching content. This section is divided into seven questions and five exercises to promote students' independent thinking. Enable students to under- stand concepts and master methods through collaborative exploration, display and communication. Be tight when analyzing examples. Define and summarize methods to achieve the goal of knowledge and skills. Multiple methods such as situational introduction, practice, group discussion, and lecture were used.
GPT3.5 (1.89)	There is no clear choice of teaching methods.
GPT3.5 Improve (4.56)	1. Teaching method: By explaining the concept and definition of logarithms, as well as the relationship between logarithms and exponents, help students understand and master relevant knowledge. 2. Exercise method: Design a certain number and difficulty of exercise questions for students to practice and consolidate, and improve their ability to use logarithms. 3. Practice method: Design a certain number and difficulty of exercise questions for students to practice and consolidate.
GPT4.0 (3.33)	1. Explanation method: Explain the concept of logarithm, the relationship between logarithms and exponents, the conversion of exponential and logarithmic expressions, and the calculation method of logarithms. 2. Problem guidance method: By asking questions, guide students to think and solve problems, understand and master the concept and calculation methods of logarithms.

GPT4.0 Improve (5.78)	1. Example method: When explaining each concept and method, I will provide examples for explanation. For example, when explaining the relationship between logarithms and exponents When it comes to the relationship, I will provide examples of how to obtain logarithmic expressions from exponential expressions and how to obtain exponential expressions from logarithmic expressions. Explaining When calculating logarithms, I will provide examples of how to calculate commonly used and natural logarithms. 2. Problem guidance method: During the explanation process, I will constantly ask questions to guide students to think and solve problems. For example, in the When explaining the concept of logarithm, I will ask the question 'If the values of base and power are known, how can I find the exponent? ' to guide students Think and answer...

situational teaching method, group situational learning method, and more. In the improved mathematics lesson plans of GPT4.0, GPT can simulate the role of a teacher to design teaching methods. For example, it can employ the "problem-oriented method" and continuously pose questions during the explanation process to guide students in thinking and problem-solving. For instance, when explaining the concept of logarithms, it may ask questions like, "If the base and exponent values are known, how can we find the exponent?" to prompt students to think and respond. When explaining how to calculate logarithms, it may pose questions like, "How do we calculate common logarithms and natural logarithms?" to encourage students' thinking and responses. Through this approach, it aims to stimulate students' thinking abilities and help them better understand and master the concept and calculation methods of logarithms."

It indicates that GPT can play a role as a teacher to a certain extent in selecting teaching methods and designing certain teaching content. Educator Eliot W. Eisner advocated that "teaching is an art" [16]. Education practitioner Saito Hibo said, "Teachers are artists. If teaching is truly creative and exploratory, it will reach an artistic level and give people artistic charm. Only through this kind of teaching can children and teachers be satisfied, grow, and achieve self-transformation. To achieve this kind of teaching, teachers must always have the same attitude as artists towards creativity. "[17] From the perspective of the artistic nature of education and teaching, it is difficult for GPT to become a qualified teacher.

Table 10. Comparison between Human Teachers and ChatGPT in the Selection and Design of English Teaching Methods

Human Teacher (7.00)	A systematic analysis has been conducted on the learning situation of students, and different methods can be selected for different types of students. A clear curriculum plan has been formed, with methods closely integrated with teaching content. For example, by having students brainstorm based on the topic before reading, activate their existing knowledge, and then show them pictures to enrich their reserves of environmental protection issues and measures. Using paragraphs 2 and 3 as examples, demonstrate how to obtain the structure and main information of the article for students. On the basis of understanding the meaning, guide students to critically think and supplement the protagonist's environmental activities, and cultivate the depth and breadth of students' thinking...
GPT3.5 (3.25)	There was no clear choice of teaching method, which was involved in the teaching process. For example, students conduct interviews with peers to discuss major environmental issues and methods of protecting the environment.

GPT3.5 Improve (4.26)	1. Collaborative learning: Through group discussions and collaborative learning, stimulate students' thinking and creativity. 2. Situational teaching: By using real situations and examples, students can better understand and apply the knowledge they have learned. 3. Task based teaching: By giving students specific tasks, cultivate their practical application abilities.
GPT4.0 (3.45)	There was no clear choice of teaching method, which was involved in the teaching process. For example, watch short videos, read articles, and engage in group interactions.
GPT4.0 Improve (4.78)	1. Adopting task-based teaching method, allowing students to learn and master knowledge by completing specific tasks. 2. Adopting group collaborative learning method, allowing students to present their own viewpoints and suggestions during group discussions, in order to improve their learning Students' ability to collaborate and express themselves orally. 3. Adopting situational teaching method, students are encouraged to learn and use English in real-life situations by simulating real environments.

6 Normativity and Innovation

Overall, in terms of instructional design, GPT demonstrates a strong ability to pro- cess and extract basic text information, enabling it to capture the content of textbooks, understand task requirements, and create relatively complete and goal-oriented lesson plans. It exhibits a degree of consistency with human teachers in terms of the scientific, goal-oriented,and comprehensive aspects of lesson plan design. The improved versions of GPT, such as GPT3.5 and GPT4.0, refine the lesson plans based on the original versions, showing increased completeness.

However, there are still notable shortcomings in terms of expression standards and logic. For example, in the context of mathematics, the original GPT3.5 states, "Explain how to convert exponential expressions into logarithmic expressions: Provide examples to illustrate the steps and methods of conversion." Yet, it fails to provide specific exam- ples. Similarly, GPT4.0 introduces a statement like, "Concept and definition of logarithms: Students need to understand the definition of logarithms, which is that the exponent that equals the base to the power of the logarithm equals the number." This expression appears to be a self-generated innovation by GPT and does not align with genuine mathematical logic and teaching requirements. Consequently, such expressions maybe challenging for students to directly comprehend, leading to potential misconceptions.

Regarding innovation and practicality, GPT's capabilities are relatively weak. It has not fully leveraged its powerful data collection and integration abilities. As a result, none of the lesson plans exhibit clear indications of innovation or practical applications.

In summary, GPT serves as a useful tool in instructional design, particularly for processing and organizing text-based information. However, human intervention and guidance, especially from educational professionals, remain essential to ensure the quality and effectiveness of education [18].

7 Conclusion

ChatGPT has outstanding performance in information extraction and generation. However, the "patternization" reflected in teaching design cannot replace the "differentiation" reflected by human teachers in teaching design. Teaching itself is a two-way interaction between teachers' teaching and students' learning, so lesson plan design reflects teachers' teaching design and innovation ability, and reflects teachers' subjective initiative and labor value.

Although ChatGPT, as an artificial intelligence model, exhibits fast and efficient content creation capabilities and a "highly human like" language interaction mode, due to limited computing resources and algorithm limitations, it proposes more "patterned" and "routine" languages. No matter how exquisite an intelligent system is, it will not completely replace humans with complex and delicate emotions. In the teaching process, despite the shortcomings of both teachers and students, the purpose of teaching is to promote human spontaneous and autonomous thinking, and to make imperfect judgments based on emotions and emotions, rather than relying solely on rational calculations and boring exercises [19].

ChatGPT cannot autonomously replace human teachers in conducting instructional design activities, it can effectively assist teachers in enhancing instructional design. It can leverage its powerful data collection and processing capabilities to enhance the relevancy of teaching content and improve its alignment. It can swiftly gather teaching sup- port materials based on teachers' needs, thereby enhancing teaching quality. It facilitates convenient updates to teaching resources, increases the novelty of instructional content, and enhances the focus on teaching content.

References

[1]OpenAI. GPT-4 Technical Report, 2023, [arXiv:cs.CL/2303.08774].

[2]Radford, A.; Wu, J.; Child, R.; Luan, D.; Amodei, D.; Sutskever, I.; et al. Language models are unsupervised multitask learners. OpenAI blog 2019, 1, 9.

[3]Hohr, H. The concept of experience by John Dewey revisited: Conceiving, feeling and "enliving" . Studies in Philosophy and Education 2013, 32, 25–38.

[4]Mizbani, M.; Chalak, A. Analyzing listening and speaking activities of Iranian EFL textbook Prospect through Bloom's Revised Taxonomy. Advances in Language and Literary Studies 2017, 8, 38–43.

[5]Neng, P. Principles of Education; Educational Principles, 1964.

[6]Baichang, Z. Important characteristics that excellent lesson plans should possess - also on the gains and losses of case design in case competitions. Information Technology Education in Primary and Secondary Schools 2011, p. 4.

[7]Wen, N.J.; Chunhua, Y. Characteristics of Excellent Teaching Plans.Educational Science 2003, 19, 2.

[8]Jingyun, L.; Suqiao, L. Preliminary Exploration of Teaching Objective Design - How to Understand, Set, and Express 3D Objectives. Education Theory and Practice: Primary and Secondary Education Teaching Edition 2014, p. 3.

[9]Yaling, S. Research on the Standards of Classroom Teaching Effectiveness 2008.

[10]Shuping, Y. Re examine the function, content, and standards of classroom teaching evaluation. Education Theory and Practice 2009, p. 4.
[11]Xinhua, J. Exploration of Key and Difficult Issues in Classroom Teaching in Primary and Secondary Schools. Teaching and Management 2005, pp. 32–33.
[12]Ping, Y.; Shifang, X. Design of Mathematics Teaching Process Targeted by Core Literacy. Mathematical Bulletin 2022, 61, 7.
[13]Lan, Y. Re understanding of classroom teaching process: Kung Fu emphasizes beyond discussion. Primary School Teaching (Mathematics Edition) 2013, 000, 3–13.
[14]Qiquan, Z. Teaching Methods: Interpretation of Concepts. Educational Research 2017, 38, 11.
[15]Wu Wenzhong, X.M. Classroom Research; Classroom Research, 2002.
[16]Eisner. Educational Imagination; Educational Imagination, 2008.
[17]of Tsukuba University, E.R.A. Fundamentals of Modern Education. Chinese Revised Edition; Funda- mentals of Modern Education. Chinese Revised Edition, 2003.
[18]Yoon, O.H. The Emergence of Chat GPT and Exploration of the Direction of Liberal Arts Education. JOURNAL OF THE KOREA CONTENTS ASSOCIATION 2023.
[19]Huichun, L. Challenges and Countermeasures for Education Reform under the ChatGPT Technology Boom. Fudan Education Forum 2023, 21, 13–23.