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Promoting optimal learning with ChatGPT: A comprehensive exploration of prompt engineering in education

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ABSTRACT

The purpose of this paper is to study the topic of prompt engineering, which serves as a valuable tool for teachers in creating optimal prompts that effectively enhance students' learning experiences with ChatGPT. This paper explores a variety of strategies related to prompt engineering. These strategies include assigning specific roles to ChatGPT, clearly defining objectives, applying constraints, utilizing structural prompt formats, refining answers through dialogues, and integrating practice exercises. Moreover, this paper specifically delves into relevant approaches to prompt engineering in the field of education, such as close question prompts, open question prompts, role-playing prompts, and Socratic prompts. It also presents the outcomes derived from a comprehensive survey conducted to assess teachers' attitudes towards the implementation of prompt engineering with ChatGPT. The collected data indicates that prompt engineering significantly contributes to the enhancement of the learning experience. This is achieved by tailoring prompts to suit individual needs, fostering greater engagement, promoting critical thinking skills, and facilitating collaborative and interactive learning environments. The findings of this study hold significant practical implications for educators. By effectively implementing prompt engineering strategies, teachers can fully harness the potential of ChatGPT to enhance students' learning experiences. By customizing prompts to individual students, educators can foster engagement, stimulate reasoning, and facilitate collaboration among students.

Contribution/ Originality: This paper explores strategies for enhancing learning experiences with ChatGPT using prompt engineering. Ample examples are provided to illustrate and reference these strategies. Educators can follow these examples to incorporate prompt engineering into their classes, enabling them to customize learning, promote engagement, stimulate critical thinking, and facilitate collaborative learning.

1. INTRODUCTION

In recent, the wave of Generative Artificial Intelligence (AI) has swept across the globe, impacting various aspects of human society. In the field of education, with the ability of ChatGPT to generate questions, take exams, write essays, complete assignments, and even outperform humans, the education sector needs to respond with innovative thinking (Cain, 2024). Like the emergence of personal computers and the use of the Internet, the impact brought by AI will initiate a global transformation. People must face the future as a society of human-machine collaboration and make early preparations. ChatGPT is a language model with the potential to disrupt existing content production models. With the continuous development of AI technologies, the role of education will face significant challenges (Rasul et al., 2023). If teachers guide students in the proper usage of ChatGPT, it can be beneficial for students to prepare for future employment. ChatGPT has sparked AI enthusiasm, indicating that

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humanity is gradually approaching a turning point in AI. The nature of work and even educational models may be affected, and the pace of industrial AI transformation will accelerate. Therefore, people develop a broad innovative mindset and implement effective strategies to respond to this global AI competition (Liu et al., 2023).

Asking questions is a crucial skill in the new era of AI. ChatGPT excels at answering all kinds of questions but lacks unique creativity. Therefore, the key to using AI to enhance competitiveness is that a user must know how to ask questions and give instructions to allow AI to provide deeper and more creative answers (Zhang, Zhou, Wu, Xie, & He, 2024). In higher education and industries in the future, the ability to ask questions and improve upon answers will be more important. Prompt engineering is an innovative technique that prepares and asks suitable questions to AI and instructs it to produce better answers. The human queries should be revised for AI understanding and responding more effectively. It emerged as a vital tool for dynamic and context-aware interactions with AI, evolving with machine learning and deep learning. In today's advanced AI applications, prompt engineering is integral, making AI accessible and powerful. The choice of prompt is crucial for generating relevant and accurate responses (O'Connor et al., 2024). Prompt engineering plays a critical role in the ongoing journey of AI, pushing the boundaries of machine understanding and enabling effective communication between humans and machines.

The purpose of prompt engineering in education is to create helpful questions and instructions to generate useful responses from ChatGPT to engage students. Useful prompts assist students in exploration of new knowledge, analysis of complicated concepts, enhancement of their learning experiences and reflection on their understanding. With prompt engineering, students can learn, and instructors can teach more efficiently. Useful prompts help students engage with topics and encourage critical thinking. Prompt engineering also offers transformative possibilities for education administrators. AI chatbots can become personalized virtual advisors, providing academic guidance and empathetic support. Adaptive learning can customize instruction and resources to individual learners in a real time manner (Ray, 2023). AI research assistants can produce insights from massive datasets. Prompt engineering also optimizes administrative processes. However, to realize these possibilities it is necessary to bridge the gap between AI capabilities and human priorities (Perkins, 2023).

This paper will initially explore the fundamental concepts of prompt engineering. Subsequently, the distinctive aspects of prompt engineering as applied in the field of education will be discussed. Finally, the paper will analyze the outcomes of a survey conducted to gather teachers' perspectives on the implementation of prompt engineering.

2. EMERGENCE OF PROMPT ENGINEERING

Recently, there are breakthroughs in computation power and the power of conversational AI has been increased. Prompt engineers focus on Large Language Models (LLMs) (e.g., GPT-3 and BERT) as the forefront of generative AI (Wang, et al., 2024). GPT (Generative Pre-trained Transformer) is a type of language model developed by OpenAI. GPT models are trained on a large corpus of text data to learn the statistical patterns and relationships within the language. BERT (Bidirectional Encoder Representations from Transformers) is a pre-trained language model developed by Google. BERT is designed to understand the context and meaning of words in a sentence by considering the surrounding words and their relationships. After these models have been trained on a large amount of datasets, they can generate text, answer questions, translate languages and mimic human writing. Prompt engineering can guide LLMs to use their training effectively. Well-designed promotes make the models' outputs more relevant, accurate and context-aware (Feng et al., 2023).

Prompt engineering is a new field that designs and improves the inputs to LLMs and related software like ChatGPT and Midjourney to enhance their performance and accuracy (Strobelt et al., 2022). Prompt engineering involves careful selection of words and phrases for input and its overall structure and organization. Recently, LLMs have been researched and applied in chatbots, voice assistants, text generation, machine translation, and other fields (Kotei & Thirunavukarasu, 2023). But there are many limitations with these models' performance and accuracy. If

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the input to the models is simple, incorrect or unsuitable, it will be time-consuming and unable to produce useful output. Prompt engineering will become a new and necessary skill with the proliferation and application of LLMs. This skill will be required by professionals in various fields like healthcare, finance, retail, education, manufacturing, media, and others. They need to use LLMs to extract useful information from a large amount of text and voice data. Prompt engineers are responsible for asking questions and giving instructions and become popular emerging jobs in the AI field. Skilled prompt engineers act as translators and guide AI models through carefully crafted prompts (Wahidur, Tashdeed, Kaur, & Lee, 2024).

Prompt engineering in the healthcare field can help to generate more accurate information about the nature of diseases, treatment plans, and medications (Meskó, 2023). Doctors use AI to search real-time community medical information and extract the latest information from various medical literatures. This can avoid reliance on pharmaceutical companies (Heston & Khun, 2023). In the financial field, AI can provide faster and more accurate information about market trends, investment strategies and risk management. Prompt engineers help investors to look for information about particular stocks or funds from domestic and international financial news. It is possible that AI synthesizes reports for different time periods like daily, quarterly and annual reports. In the retailing field, prompt engineering can produce more useful information about consumer behaviors, market trends and products (Korzynski, Mazurek, Krzypkowska, & Kurasinski, 2023). Retailers also take advantage of big data models to understand consumer preferences and obtain valuable information from extensive market research. In the field of education, AI provides intelligent teaching assistance tools for teachers and students. Prompt engineering can assist in academic question answering for students, including math programming, video, drawing, music, and guided tours. Prompt engineering can also design automatic assessment systems to analyze students' assignments, exam answers, and individual learning behaviors, among others (Sullivan, Kelly, & McLaughlan, 2023).

3. PRACTICAL TECHNIQUES OF PROMPT ENGINEERING

AI is revolutionizing the way people learn, research, and work. If used effectively, it can help increase productivity. To remain competitive, it is necessary to learn how to use ChatGPT and other AI tools. To maximize the potential of ChatGPT, it is essential to ask it the right questions. Prompt engineering is the art of prompting ChatGPT in the most effective way to get the desired results (Velásquez-Henao, Franco-Cardona, & Cadavid-Higuita, 2023). The following are practical techniques for both beginners and advanced users in ChatGPT prompt engineering.

3.1. Assigning a Role to ChatGPT

A user can make ChatGPT conversations more engaging by requesting ChatGPT to play various roles. Whether historical figures or professionals in specific fields, this approach adds captivating twists to users' interactions. In reality, when seeking advice, people look for experts in the respective field. For example, people seek financial advice from trained investment experts and fitness advice from personal trainers. A user may treat ChatGPT in the same way. To seek advice or ideas, ChatGPT may be given an appropriate role. For example, if a user wants ChatGPT to write sales copy, the prompt may be "*You are a trained copywriter and provides copywriting services for 10 years. You are good in writing copy for the financial industry.*" When a user asks for a healthy diet plan, the prompt may be "*You are an expert nutritionist, health coach, and personal trainer. You have been helping people lose weight and gain muscle. Please suggest a diet plan for young men in their 30s.*"

3.2. Defining Objective

When ChatGPT knows what a user wants, its suggestions will better meet the needs. It is necessary to tell ChatGPT what goal to be achieved, and it will adjust its response accordingly. The prompt should be as specific as possible about what the objective is Wang, et al. (2024). For example, ChatGPT is asked to write a Tweet about the

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importance of learning how to use a new product. The objective is to find subscribers for an email newsletter. The Tweet describes the benefits of learning how to use the new product in a more specific way. Such a Tweet is more likely to help us achieve the goal of converting people into newsletter subscribers.

A user may request examples for clarification (Fraiwan & Khasawneh, 2023). This not only provides clarity but also adds practicality to the information. The more specific the prompt, the more targeted and precise the response will be. Clear prompts lead to more effective and efficient interactions. When necessary, a user may start a new chat session after extensive interactions. This helps keep the conversation clear and accurate, avoiding confusion from previous discussions.

3.3. Applying Constraints

A user can guide ChatGPT's response output by providing more constraints or details about what should or should not appear in the answer. Constraints can help ChatGPT understand what a user wants and avoids irrelevant outputs (Rospigliosi, 2023). For example, to avoid getting overly concise or overly detailed answers and maintain information that is concise, a user may specify the length of the answer like "*Generate a 100-word summary of a news article*". Whether bullet points, tables, or narrative format, specifying preferred response format helps build the information in a way that is most useful to the user like "*Generate a blog keyword table related to baking and include 'Article Title Example' and 'Target Audience' as columns.*"

A user may provide example output formats for more tailored answers. This one-shoot prompt that helps the model to accurately understand what the user requests. A user may provide examples of the expected output like "*Generate a poem about love, with a style and tone like this example: …….*" In addition, a user may present complicated information but ask ChatGPT to break it down to examples for a young kid. This technique makes even the most difficult concepts easy to be understood.

Similarly, a few-shot learning is a technique that learns and adapts from a limited amount of data (Yong, Jeon, Gil, & Lee, 2023). Machine learning traditionally learns from large datasets while few-shot learning only allows AI to learn from a few examples. This is comparable to humans learning new skills with few examples and scarce data.

3.4. Providing Structural Prompts

People may use different writing techniques to create persuasive and engaging responses in copywriting and storytelling. A use can instruct ChatGPT to produce more compelling content with a given structure. For example, a good story typically follows a specific formula involving conflict, character development and resolution like "*Write a story about Peter using the given formula: The story takes place in _____, in a society where _____. One day, Peter _____ because _____.*"

Moreover, users may specify the desired emotional tone and customize their interactions. This helps to obtain responses to align with the mood and context of the query. User may use prompts involving storytelling and dialogue to ignite imagination of ChatGPT to encourage more creative and engaging responses (Tlili et al., 2023).

3.5. Refining Answers Through Dialogue

To break down complex tasks into smaller and more manageable steps yields more accurate and targeted responses. This technique is chain-of-though prompting used by prompt engineers to guide AI models to follow a logical sequence of steps to draw a conclusion. This approach breaks down complex problems into smaller ones to improve transparency and outcome accuracy, especially with large language models. It is a good practice to break down complex systems into modules. This applies to tasks given to AI models. A complex task often has a higher error rate than a simple one. In addition, a complex task can be redefined as workflows of simpler tasks, where the output of a task is the input to the following task (Ali, Choy, Divaharan, Tay, & Chen, 2023).

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If the output is longer than expected, the user may request a concise answer. If the output is simpler than expected, the user may ask for expert-level writing. If a certain format is required, the user may show the expected format. ChatGPT can keep track of the entire conversion history. A user can explore deeper into a specific answer by asking follow-up questions. Following are some useful follow-up prompts to refine ChatGPT answers:

- *Add relevant emojis as bullet points.*
- *Add some ironic humor to it.*
- *Explain the previous text as if you were 10 years old.*
- *Format the answer into a table.*
- *Make it more formal/informal in tone.*
- *Summarize the previous text into a Facebook post.*
- *Turn it into an actionable list.*
- *Write the article from the perspective of a politician.*

By refining ChatGPT's output through dialogue, a user can obtain more personalized and accurate answers. This approach is particularly effective for complex questions, as it helps a user better understand the answers generated by ChatGPT and provides improved results. AI models make more reasoning errors when attempting to answer immediately instead of taking time to find the answer. Requesting intermediate steps in the answer can help the model reason more reliably towards the correct answer.

3.6. Practicing Exercises

If performance can be measured, improving it becomes easier. Practice makes perfect, so experiment with different techniques to create meaningful and effective inputs for ChatGPT. These skills and insights will develop understanding of the strengths and limitations of this AI model. A user may continuously try different techniques, and add various types of constraints, provide comprehensive examples, and modify the language to see which methods are most effective in each specific use case. Then, the user may refine the prompts based on the obtained results. Therefore, to ensure changes have a net positive effect on performance, it may be necessary to define comprehensive testing suites (Heaven, 2023).

In summary, prompt engineering is the technique of using prompts or questions to guide machine-generated content. It plays a crucial role in natural language processing and data generation tasks. By following the basic principles, prompts generate accurate and context-aware content. Continuous experimentation and learning are key to mastering prompt engineering, which can lead to better results in AI application.

4. PROMPT ENGINEERING IN EDUCATION

A prompt is an instruction or question posed by a human user to ChatGPT to trigger specific responses (Wang et al., 2024). Prompt engineering creates and refines prompts to obtain more helpful responses. In education, there are several types of prompts. The first type is close question prompts that anticipate closed-ended and definitive answers. They are factual responses and help users understand basic concepts. The second type is open question prompts that encourage theoretical responses and stimulate high order thinking. They are used to explore complicated topics and foster creativity. The third type is role-playing prompts that assign a role to ChatGPT. This makes ChatGPT perform like an expert and the information provided by ChatGPT is more professional and specific. The fourth type is Socratic prompts that are a sequence of questions and answers after the method used by Socrates, an ancient Greek philosopher. This method encourages asking a question based on the answer to previous question to probe deeper into the matter.

A good prompt should be clear and precise to obtain the expected response. It is necessary to avoid confusion and ambiguity. An effective prompt is a clear instruction and easy to understand. It should focus on a particular feature of a topic with a clear definition (Giray, 2023). Good prompting keeps the discussion focused and avoids

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being too generalized. The prompt should be relevant to learning objectives. Students can engage with the prompt that contributes to their development and progress. Prompts may be derived from the syllabus and customized to students' skills and knowledge.

Moreover, a good prompt should stimulate critical thinking and encourage students to evaluate and analyze data, instead of memory retrieval only. It enhances deeper understanding of the topic and high-order cognitive skills. In addition, a good prompt should encourage students to utilize their skills and knowledge to real-life situations and bridge the gap between practice and theory. These prompts may include decision-making processes like cases studies and role-plays. They provide opportunities for students to exercises skills and knowledge. The following are examples of prompts used in business education and science education.

4.1. Examples of Prompts used in Business Education

4.1.1. Close Question Prompts

- *Name the four main functions of management.*
- *List the elements of the marketing mix.*
- *Identify the four types of market structures.*
- *What are the five steps in the decision-making process?*
- *What are the three primary financial statements?*

4.1.2. Open Question Prompts

- *Discuss the impact of globalization on business operations.*
- *Explain how technology has transformed the marketing landscape.*
- *What are the ethical considerations in corporate social responsibility?*
- *How can businesses enhance customer satisfaction and loyalty?*
- *What are the emerging trends in digital marketing?*

4.1.3. Role-Playing Prompts

- *You are a manager in a retail store and deal with a dissatisfied customer. How do you handle the situation? What actions do you take to resolve the issue?*
- *Role-play a negotiation with a difficult client who is requesting a discount.*
- *You are a team leader facing a conflict between team members. How do you mediate the situation and restore productivity?*
- *You handle a company experiencing a public relations crisis. How do you manage the situation and maintain the company's reputation?*
- *You are a business consultant and advise a company on expanding into new markets. What strategies do you recommend?*

4.1.4. Socratic Prompts

- *A company is experiencing declining sales. Identify potential causes and provide evidence to support each one. What additional information do we need? Which cause should be addressed immediately? What is the worst-case scenario that must be avoided?*
- *What are the ethical considerations of a company's decision to outsource production? What are the potential benefits and risks? How can the risks be mitigated?*
- *How can we analyze a market from different perspectives? What biases can influence market analysis? List five biases that business professionals can have when evaluating market trends.*

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- *Are there multiple strategies to enter a new market? What is the industry standard? What are the advantages and disadvantages of alternative approaches? How can businesses effectively adapt to changing customer preferences?*
- *How can businesses improve their customer service? List five ways to enhance the customer experience. What are the potential benefits and risks of each approach?*

4.2. Examples of Prompts Used in Science Education

4.2.1. Close Question Prompts

- *What are the three states of matter?*
- *Name the planets in our solar system.*
- *Identify the three primary colors.*
- *What are the three types of rock?*
- *List the five kingdoms of living organisms.*

4.2.2. Open Question Prompts

- *Discuss the impact of climate change on biodiversity.*
- *Explain the process of photosynthesis and its importance in the ecosystem.*
- *What are the potential benefits and risks of genetically modified organisms (GMOs)?*
- *How can renewable energy sources contribute to reducing carbon emissions?*
- *Discuss the applications and ethical considerations of gene editing technologies like CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) that is a molecular tool that allows scientists to make precise changes to DNA in living organisms, guided by a small RNA molecule that can target specific DNA sequences.*

4.2.3. Role-playing Prompts

- *You are a scientist conducting an experiment. Describe the steps you would take to ensure accurate and reliable results.*
- *Role-play a conversation between a conservationist and a developer discussing the impact of a proposed construction project on an endangered species' habitat.*
- *You are a science teacher explaining the concept of evolution to a group of students. How would you engage them in the topic and address any potential misconceptions?*
- *You are a scientist presenting your research findings to a panel of experts. How would you communicate your results effectively and address any questions or criticisms?*
- *You are a science journalist interviewing a renowned scientist about their groundbreaking discovery. What questions would you ask to ensure a comprehensive and engaging article?*

4.2.4. Socratic Prompts

- *How does the greenhouse effect contribute to global warming? What are some potential solutions to mitigate its effects?*
- *Discuss the relationship between genotype and phenotype. Provide examples and explain how genetic variations can influence traits.*
- *What are the ethical implications of using animals in scientific research? What alternatives exist, and how can we strike a balance between scientific progress and animal welfare?*
- *Compare and contrast mitosis and meiosis. What are the significance and implications of each process in the life cycle of organisms?*
- *How does natural selection drive the process of evolution? Provide examples and discuss the mechanisms by which advantageous traits become more prevalent in a population.*

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5. SURVEY AND ITS RESULTS

A guideline of prompt engineering was prepared for teachers in a university, and they have accumulated experience of prompt engineering applied in their classrooms for a semester. A survey was conducted to collect data from 120 teachers, and the data are about their opinions on prompt engineering of ChatGPT. Table 1 presents the average responses to these questions.

Table 1. Results of survey collecting data about teachers' opinions on prompt engineering of ChatGPT.

Survey questions **(1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree)** **With prompt engineering, ChatGPT can:**	**Mean**
1. Provide personalized learning experiences based on tailored prompts.	3.6
2. Be customized to meet individual learning needs.	3.9
3. Provide personalized guidance and support through prompts tailored to a student's work.	4.2
4. Provide differentiated instruction and personalized learning experiences tailored to individual needs.	4.3
5. Enhance student engagement through thoughtfully crafted prompts.	3.8
6. Promote critical thinking by employing prompts that challenge assumptions.	3.7
7. Challenge students to evaluate, analyze, and justify their ideas.	4.3
8. Encourage exploration and curiosity through prompts that prompt students to delve deeper into topics.	4.1
9. Foster interactive and participatory learning experiences.	3.9
10. Help practice and improve language skills with targeted prompts.	4.4
11. Increase accessibility to education by incorporating prompts that cater to diverse learning needs.	3.7
12. Make conversations more accessible with clear and structured prompts that cater to diverse learning styles.	3.9
13. Provide individualized feedback by utilizing prompts tailored to each student's work.	4.3
14. Provide insights into students' learning progress through formative assessments.	4.2
15. Provide continuous assessment by eliciting responses from students through prompts.	4.1
16. Facilitate collaborative learning by incorporating prompts that encourage group discussions and problem-solving.	3.9
17. Support diverse learning styles with prompts designed for different modalities.	4.0
18. Facilitate collaborative learning experiences that engage students in group discussions or problem-solving scenarios.	4.2
19. Offer scaffolding and guidance with prompts that support step-by-step learning.	3.9
20. Develop critical thinking and analytical skills as students navigate problem-solving scenarios.	4.2
21. Efficiently deliver content by utilizing prompts that present information in a clear and concise manner.	3.9
22. Offer interactive simulations and demonstrations through prompt-based interactions.	4.3
23. Support the development of metacognitive skills as students reflect on their thinking.	4.1
24. Instill confidence in students with clear and accurate responses.	3.9
25. Prepare students for future technology by incorporating prompts that expose them to emerging technologies and their applications.	4.2
26. Extend learning opportunities beyond the classroom for additional practice.	3.8

The survey results show positive attitudes towards the usage of prompt engineering in education. Prompt engineering in ChatGPT empowers a wide range of functions that enhance the learning experience. Through tailored prompts, ChatGPT can provide personalized learning experiences, catering to individual needs and offering customized guidance. It fosters engagement and critical thinking by presenting thought-provoking prompts that challenge assumptions and encourage students to evaluate and justify their ideas (Duha, 2023). In addition, it promotes exploration, curiosity, and interactive learning to nurture a participatory environment. Targeted prompts can help students to practice and improve language skills while accommodation of diverse learning needs and styles can increase accessibility. ChatGPT facilitates individualized feedback, formative assessments, and continuous assessment through prompt-based interactions and this ensures timely and relevant evaluation (Fergus, Botha, & Ostovar, 2023). With prompt engineering, ChatGPT supports collaborative learning and foster group discussions and problem-solving scenarios. ChatGPT provides scaffolding and guidance to enable stepwise learning and the development of metacognitive skills (Heimans, Biesta, Takayama, & Kettle, 2023). Clear and concise prompts can lead to efficient content delivery complemented by interactive simulations and demonstration. ChatGPT offers accurate and confident responses to instill confidence in students. Furthermore, ChatGPT exposes students to new

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technologies and prepares them for the future and extends learning opportunities beyond the classroom. Prompt engineering in ChatGPT revolutionizes the learning experience because of promotion of engagement and critical thinking (Roumeliotis & Tselikas, 2023).

6. CONCLUSION

It is necessary to understand the nuances of prompt engineering to make the most of ChatGPT's full capabilities. In this journey, a user does not only issue commands but also engages in an art form that balances precision and creativity. To take full advantage of AI, it is important to combine recommended practices with real-world insights. A careful prompt can translate human meaning into machine interpretation. Poor prompts restrict AI to superficial responses while precise ones can enable meaningful engagement with contextual framing and adaptive feedback. Prompt engineering draws from fields like psychology, anthropology, semiotics, linguistics, and rhetoric to release AI's natural conversation abilities. It combines technical expertise and creative artistry. Well-designed prompts achieve desired interactions and builds AI systems capable of sophisticated conversation. This process is iterative and collaborative, and it conceptualizes purpose and context, outlines conversational frameworks and refines prompts based on user feedback. This harmonious blend of science and art ensures AI understands context and responds appropriately and avoids limited responses and overreaching (Cooper, 2023). To use ChatGPT effectively lies in the ability to craft clear, specific and imaginative prompts. A good prompt is not just an instruction but it can foster dynamic and creative dialogues with AI. As a user begins application of various techniques, one will observe a transformation in interactions with ChatGPT. Users will evolve into more valuable, effective and enjoyable experiences. The evolution of communication with ChatGPT is not only achieving immediate goals but also exploring the immense potential of AI interaction. Users seize the opportunity for experimentation and innovation to see their conversations with ChatGPT reach new heights in efficiency and engagement (Lo, 2023). Prompt engineering in education can be applied to enhance various aspects of the learning process (Rusandi, Ahman, Saripah, Khairun, & Mutmainnah, 2023). For example, prompt engineering designs and improves the input to the AI-enabled educational models. This can generate more accurate and comprehensive educational content. Teachers query real-time educational resources from a large amount of educational literature, instead of outdated and limited materials (Huang, 2023). AI generates assessments and evaluations that provide timely and relevant feedback to students (Benuyenah, 2023). Teachers design targeted prompts to evaluate how students understand concepts, think critically and justify their needs. This facilitates formative assessment that evaluates the students' progress continuously. Moreover, prompt engineering can personalize prompts to individual students' requirements and learning styles. Students can engage in interactive learning, explore their curiosity and develop their language skills. Prompt engineering encourage discussions, provides problem solving scenarios, and enhance the development of metacognitive skills (Yenduri et al., 2023). This also provides personalized feedback and assessment and foster collaborative and interactive learning environments.

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