Using ChatGPT Standard Prompt Engineering Techniques in Lesson Preparation: Role, Instructions and Seed-Word Prompts

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Abstract – **The application of available natural language processing systems can have a significant impact on the education process. The primary aim of this research was to test the impact of three standard prompting techniques on the results obtained from ChatGPT. Generation of a lesson plan for programming for preschoolers was chosen as the task set for AI. The obtained results show that use of a standard prompting with additional defined roles and seed words can be useful in preparation of teaching units and lessons and it can be considered as a technique of teachers' choice.**

Keywords – **ChatGPT, Prompt engineering, Prompt techniques, IT education lesson plan.**

I. INTRODUCTION

Advancements in natural language processing (NLP) have resulted in the creation of potent language models, such as the Generative Pre-trained Transformer (GPT), which includes large language models (LLM) like ChatGPT and GPT-4. These models have been pre-trained on extensive text data and have exhibited remarkable performance in various NLP tasks, such as language translation, text summarization, and question answering. According to its own description [1], ChatGPT is "a powerful machine learning software that uses the Generative Pre-trained Transformer (GPT) algorithm to generate human-like responses to text-based inputs".

Transformative potential of AI could revolutionize education with ChatGPT and other solutions already available. Usually, ChatGPT is used for content creation, research assistance and language learning (including computer languages coding) [2]. Numerous researches in this area raise questions on a wide range of topics, from learning effectiveness [3], [4] to academic integrity and honesty [5-8]. More than 80 ways how to enhance teaching and learning using AI are presented in [9].

The extensive datasets used to train pre-trained language models allow them to acquire substantial linguistic and factual knowledge, and prompt engineering techniques can be utilized to tailor these models for specific tasks. The experiment of altering user prompts for the task of teaching programming for young children is given in this paper.

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II. PROMPT ENGINEERING BASICS

Although GPT has remarkable abilities, it can generate plausible yet untrue outputs, causing the boundary between reality and illusions to blur [10].

Prompt engineering means creating input prompts that encourage precise and useful responses from LLMs [11]. Engineers can develop a profound understanding of GPT's capabilities and constraints to design prompts that help the model generate valuable insights while reducing the likelihood of producing false information and illusions.

As AI technology continues to advance rapidly, the ability to effectively communicate with AI systems in order to achieve desired outcomes, i.e. prompt engineering (PE), has become an increasingly valuable skill.

There are different approaches to the prompt engineering techniques, mostly defined by experiments conducted.

Practical considerations of prompt engineering techniques in [12] proposed three principles:
- Be very specific in your instructions
- Ask GPT to break its work into small chunks, just as you would with a human and
- Ask GPT to check and improve its own output.

Specific format for the prompt (prompt formula) is usually composed of 3 main elements [13]: task or a clear and concise statement of what the prompt is asking the model to generate, the instructions that should be followed by the model when generating text and the role that the model should take on when generating text.

There are various prompt engineering techniques that can be used with ChatGPT. John in [13] discusses more than twenty different types of prompts that can be use depending on task or role.

III. METHOD

A. Prompt Task and Role Definition

For the purpose of this exploration, the task what the prompt is asking the model to generate is creation of the lesson plan for teaching sequence of instructions in programming for preschoolers.

The role is a teaching expert – teacher or preschool teacher capable to perform IT education with young children.

B. Prompt Techniques

For the purpose of this research standard prompting techniques is selected. Enhancement of this prompting style is performed adding role, instructions and seed-word prompts.

Standard prompts are a simplest way to direct the output of ChatGPT by defining a specific task for the model to complete and prompt formula is *"Generate a [task]"*.

Task is a creation of lesson plan for teaching unit that offer understanding of basic computational concept such is the sequence of programming instructions.

Prompt formula:

Generate a lesson plan for teaching sequence of instructions in programming for preschoolers

Standard prompts can be combined with other techniques like role prompting and seed-word prompting to enhance the output of ChatGPT.

The role prompting technique provide specific role for the model to take on. This technique is useful for generating text that is tailored to a specific user. Prompt formula is *"Generate [task] as a [role]"*. In our case, the role is preschool teacher capable to perform IT education with young children.

Task:

Generate a lesson plan for teaching sequence of instructions in programming for preschoolers

Role:

Preschool teacher

Prompt formula:

"As a preschool teacher, generate a lesson plan for teaching sequence of instructions in programming for preschoolers"

The seed-word prompting is a technique used to control the output of ChatGPT by providing it with a specific seed-word or phrase. The prompt formula is usually similar with phrase *"Generate text based on the following seed-word:[seed-word]"*.

Finally and according to our task and role definition, standard prompting technique with role, instructions and seed-word prompts is as follows:

Task:

Generate a lesson plan for teaching sequence of instructions in programming for preschoolers

Instructions:

The lesson plan should be realistic, without computer devices and should be appropriate for preschool children

Role:

Preschool teacher

Seed-word1:

"Appropriate for children aged 5 to 7 years"

Seed-word2:

"Unplugged"

Prompt formula:

"As a preschool teacher, generate a realistic lesson plan for teaching sequence of instructions in programming, unplugged and appropriate for teaching children aged 5 to 7 years"

IV. RESULTS AND DISCUSSION

A. Standard Prompting

[ChatGPT Prompt A]: "Generate a lesson plan for teaching sequence of instructions in programming for preschoolers"

[ChatGPT]: *Sure! Here's a sample lesson plan for teaching sequencing of instructions in programming for preschoolers:*

Lesson: Introduction to Sequencing in Programming

Objective: To teach preschoolers about the importance of sequencing in programming and to introduce them to basic programming concepts.

Materials:

- *A set of picture cards with simple actions (e.g., brush teeth, put on shoes, wash hands, etc.)*
- *A large board or easel with space for arranging the picture cards in sequence*
- *A simple programming app or game, such as ScratchJr or Kodable*

Procedure:

1. *Introduction (5 minutes):*
   Start the lesson by asking the children if they have ever followed a set of instructions before. Ask them if they know what it means to "follow directions." Explain that when we use a computer or device, we have to give it specific instructions in a specific order so that it knows what to do.

2. *Picture sequencing activity (10 minutes):*
   Pass out the picture cards and ask the children to put them in order, starting with the first action and ending with the last action. Encourage them to talk about why they put the cards in that order and what might happen if they changed the order. Have a few children share their sequencing with the group.

3. *Sequencing on the board (10 minutes):*
   Using the board or easel, demonstrate how to sequence instructions by arranging the picture cards in order. Ask the children to suggest what the next step might be and add the appropriate card to the sequence. Continue until all of the cards have been added to the sequence.

4. *Programming app/game (15 minutes):*
   Introduce a simple programming app or game, such as ScratchJr or Kodable. Explain that in this app/game, they will be able to give instructions to a character or object and make it do things. Demonstrate how to give a simple instruction, such as "move forward," and show how the character responds. Encourage the children to try giving instructions on their own.

5. *Conclusion (5 minutes):*
   Wrap up the lesson by asking the children to share what they learned about sequencing in programming. Review the importance of putting instructions in the correct order and ask them to think about how they might use sequencing in other areas of their lives.

Assessment:

Observe the children as they work on the picture sequencing activity and the programming app/game. Ask

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questions to gauge their understanding of sequencing and programming concepts. Provide feedback and encouragement as needed.

B. Standard Prompting with Role Prompt

[ChatGPT Prompt B]: "As a preschool teacher, generate a lesson plan for teaching sequence of instructions in programming for preschoolers"
[ChatGPT]: *Sure, here's a sample lesson plan for teaching sequence of instructions in programming to preschoolers:*
  Subject: Introduction to Sequence of Instructions in Programming
  Objective:
- *To teach preschoolers the basics of sequence of instructions in programming*
- *To help children understand the importance of sequencing in programming and in everyday life*
- *To encourage children to think logically and follow instructions step-by-step*

  Materials Needed:
- *Picture cards with simple instructions (e.g. "brush your teeth," "put on your shoes," "eat breakfast," etc.)*
- *A large piece of paper or a whiteboard for drawing*
- *Markers or colored pencils*

  Lesson Plan:
  1. *Introduction (5 minutes)*
     Begin the lesson by introducing the concept of sequencing. Explain that sequencing is the process of putting things in order or following a series of steps to complete a task.
     Ask the children if they can think of any examples of sequencing in their daily lives, such as getting dressed, making a sandwich, or building with blocks.
  2. *Sequence Picture Cards (10 minutes)*
     Show the children a set of picture cards with simple instructions, such as "brush your teeth," "put on your shoes," and "eat breakfast."
     Ask the children to help you put the cards in order, starting with the first step and ending with the last step.
     As the children put the cards in order, ask them to explain why they think each step comes next.
  3. *Drawing a Sequence (15 minutes)*
     Give each child a piece of paper and some markers or colored pencils.
     Ask the children to draw a picture of a task they do every day, such as getting dressed or eating breakfast.
     Encourage the children to draw each step in order and to use arrows or numbers to show the sequence of steps.
  4. *Sequencing Game (15 minutes)*
     Play a game with the children where they have to follow a sequence of instructions to complete a task.
     For example, you could say, "Put your hands on your head, then jump up and down, then spin around in a circle." The children would then have to follow the instructions in the correct order.

You could also have the children take turns giving each other sequences of instructions to follow.
  5. *Conclusion (5 minutes)*
     Wrap up the lesson by reviewing the concept of sequencing and how it relates to programming and everyday life.
     Encourage the children to think about sequencing in their daily activities and to practice following instructions step-by-step.
  Assessment:
- *During the sequencing game, observe how well the children are able to follow the sequence of instructions.*
- *Look at the children's drawings to see if they were able to sequence the steps in order.*
- *Ask the children to explain the importance of sequencing and why it is important to follow instructions step-by-step.*

C. Standard Prompting with Role, Instructions and Seed-Words

[ChatGPT Prompt C]: "As a preschool teacher, generate a realistic lesson plan for teaching sequence of instructions in programming, unplugged and appropriate for teaching children aged 5 to 7 years"
[ChatGPT]: *Sure! Here's a lesson plan for teaching the sequence of instructions in programming to preschoolers aged 5 to 7 years old:*
  Topic: Sequence of Instructions in Programming
  Objective:
- *To introduce the concept of sequence of instructions in programming*
- *To teach children how to follow and create a sequence of instructions*

  Materials Needed:
- *Whiteboard and markers*
- *Construction paper*
- *Scissors*
- *Glue*
- *Colored pencils or markers*
- *Dice*

  Introduction:
  1. *Gather the children in a circle and ask if they have ever played a game that required them to follow a set of instructions.*
  2. *Introduce the concept of programming and explain that just like in a game, computers also follow a set of instructions.*
  3. *Ask the children if they know what instructions are and how they work.*

  Activity 1: Following Instructions
  1. *Write a simple set of instructions on the board, such as "clap your hands, jump up and down, and spin around."*
  2. *Have the children follow the instructions in the correct sequence.*

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3. *Repeat the activity with different sets of instructions, gradually increasing the complexity.*

Activity 2: Creating a Sequence of Instructions
1. *Distribute construction paper, scissors, and glue to the children.*
2. *Explain that they will be creating a craft, but they can only use the materials in a specific sequence.*
3. *Roll the dice to determine the sequence of materials to use (e.g. 1=scissors, 2=construction paper, 3=glue).*
4. *Have the children create their craft using the materials in the correct sequence.*
5. *Repeat the activity with different sequences, gradually increasing the complexity.*

Activity 3: Drawing a Sequence of Instructions
1. *Distribute colored pencils or markers to the children.*
2. *Explain that they will be drawing a picture, but they can only use the colors in a specific sequence.*
3. *Roll the dice to determine the sequence of colors to use (e.g. 1=red, 2=blue, 3=green).*
4. *Have the children draw their picture using the colors in the correct sequence.*
5. *Repeat the activity with different sequences, gradually increasing the complexity.*

Conclusion:
1. *Ask the children to reflect on what they learned about programming and the sequence of instructions.*
2. *Ask if they can think of any other activities in which the sequence of instructions is important.*
3. *Encourage them to continue practicing following and creating a sequence of instructions.*

D. Research Question Discussion

RQ1: How did ChatGPT respond on standard prompting technique with three different types of prompts related to the same topic?

We faced ChatGPT with a task broadly related to programming at early ages, i.e. to generate lesson plan for teaching sequence programming. First finding is that the capacity of GPT to emulate human-like responses is truly immense. In all three prompt cases response was aligned with task and theme and lesson plans were created in accordance with literature. Secondly, the structure of the plan follows recommendations and positive practice (objectives, materials needed, lesson outline etc.).

Despite this, there are notable differences between three lesson plans obtained from GPT.

In first case, GPT generate activities that propose using of devices and software which is suitable for preschoolers. Refined with role of preschool teacher, lesson plan was adapted and using of devices is excluded from the lesson plan.

Answer to the third prompt based on standard prompting with role, instructions and seed-word prompt is closest to the human-like understanding of the task and activities are adapted to the preschool children aged 5-7 years. Lesson plan offered here is more detailed and includes three activities (term used in preschool education instead of "teaching unit" or "lesson") which assume "unplugged" programming.

V. Conclusion

The instructions for successful prompting ChatGPT as a tool for lesson plan preparation is proposed in this paper.

This exploratory study applies an incrementally development of the standard prompt engineering technique in order to investigate the responses they have may influenced. Role, detailed instructions and seed-words were added to the standard prompt. Results obtained indicate that carefully tailored standard prompting with additional role and seed-word definitions can be teacher's strategy of choice during the lesson plan generation process which is based on the use of ChatGPT.

References

[1] T. Adiguzel, M. H. Kaya, and F. K. Cansu, "Revolutionizing education with AI: Exploring the transformative potential of ChatGPT", Contemporary Educational Technology, vol. 15, no.3, article no. ep429, 2023, doi: 10.30935/cedtech/13152.

[2] M. Adelson, *The ChatGPT Goldrush: Profiting from the AI Revolution - Prompt Engineering Mastery with chatGPT-4*, 2023.

[3] A. Flogie and B. Aberšek, *The Impact of Innovative ICT Education and AI on the Pedagogical Paradigm*, Newcastle, Cambridge Scholars Publishing, 2019.

[4] M. Firat, "What ChatGPT means for universities: Perceptions of scholars and students", Journal of Applied Learning &Teaching, vol. 6, no. 1, 2023, doi: 10.37074/jalt.2023.6.1.22.

[5] M. Sullivan, A. Kelly, P. McLaughlan, "ChatGPT in Higher Education: Considerations for Academic Integrity and Student Learning", Journal of Applied Learning & Teaching, vol. 6, no.1, 2023, doi: 10.37074/jalt.2023.6.1.17.

[6] C. Karthikeyan, "Literature Review on Pros and Cons of ChatGPT Implications in Education", International Journal of Science and Research (IJSR), vol. 12, no. 3, pp. 283-291, March 2023.

[7] S. Wolfram, *What Is ChatGPT Doing ... and Why Does It Work?*, Champaign IL, USA, Wolfram Media, Inc. 2023

[8] D. R.E. Cotton, P.A. Cotton, and J.R. Shipway, "Chatting and Cheating: Ensuring Academic Integrity in the Era of ChatGPT", Innovations in Education and Teaching International, 2023, doi: 10.1080/14703297.2023.2190148.

[9] S. Skrabut, *80 Ways to Use ChatGPT in the Classroom Using AI to Enhance Teaching and Learning*, Rhode Island, 2023.

[10] E. M. Bender, T. Gebru, A. McMillan-Major, and S. Shmitchell, "On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?", 2021 ACM Conference on Fairness, Accountability, and Transparency, March 2021, pp. 610-623.

[11] F. Petroni, P. Lewis, A. Piktus, T. Rocktäschel, Y. Wu, A. H. Miller, and S. Riedel, "How Context Affects Language Models' Factual Predictions", arXiv preprint arXiv:2005.04611, 2020, Available at: https://arxiv.org/pdf/2005.04611.pdf

[12] B. Whately, "3 Principles for Prompt Engineering with GPT-3," LinkedIn Pulse, December 3, 2022, Available at: https://www.linkedin.com/pulse/3-principles-prompt-engineering-gpt-3-ben-whately/

[13] I. John, *The Art of Asking ChatGPT for High-Quality Answer: A Complete Guide to Prompt Engineering Techniques*, Nzunda Technologies Limited, 2023.