# ROCOR - The Impact of Refined AI Prompt among Students: An Experimental Study

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**Abstract:** The integration of artificial intelligence (AI) in education has transformed student learning and interaction with information. However, the quality of AI-generated responses significantly impacts student outcomes. This study investigates the impact of the ROCOR (Relevance, Objectivity, Clarity, Organization, Responsiveness) framework on the effectiveness of AI-powered learning tools among college students. The ROCOR framework provides a structured guide for developing high-quality AI prompts tailored to student needs. Using a quantitative approach, this study examines the influence of the ROCOR framework on student engagement, learning outcomes, and perceptions of AI-powered tools. Results indicate that implementing the ROCOR framework significantly improves student writing skills and their ability to effectively utilize AI tools. The findings suggest that ROCOR enhances educational experiences by providing more targeted and timely feedback, leading to increased student motivation and perseverance. Additionally, AI integration in education can generate valuable data to inform broader educational strategies and develop critical thinking and problem-solving skills. Recommendations for future research include expanding the sample size, conducting longitudinal studies, and exploring the application of refined AI prompts across various courses and subjects.

## INTRODUCTION

Artificial intelligence (AI) has revolutionized the way students learn and interact with information. One of the most prominent AI tools in education is ChatGPT, a language model developed by OpenAI that has gained widespread attention for its ability to generate human-like text responses (4, 7). ChatGPT has been hailed for its potential to enhance teaching methods, increase student engagement, and provide personalized learning experiences (4). However, the widespread adoption of ChatGPT and other AI tools among college students has also raised concerns about the quality and effectiveness of the responses generated by these systems (5).

A crucial aspect of AI in education is prompt engineering, which involves designing prompts or instructions that guide AI systems to generate relevant and useful responses for students (1, 3, 4). The quality and effectiveness of AI-generated responses can have a significant impact on student learning outcomes. Unfortunately, many students are still using ChatGPT and other AI tools with poor prompt frameworks, resulting in responses that are often boring, generic, and robotic in tone (1, 2, 5).

The ROCOR (Relevance, Objectivity, Clarity, Organization, Responsiveness) framework has been proposed as a comprehensive guide for developing high-quality AI prompts that cater to the specific needs and preferences of students (3, 4, 6). This research aims to investigate the impact of the ROCOR framework on the effectiveness of AI-powered learning tools among college students. Specifically, we examine the influence of the ROCOR framework on student

engagement, learning outcomes, and perceptions of AI-powered learning tools.

## Research Questions:

1. How does the use of a refined AI prompt engineering framework, such as ROCOR, impact student engagement with AI-powered learning tools?
2. What is the effect of a refined AI prompt engineering framework on the learning outcomes of students using AI-powered learning tools?
3. How do students perceive the use of AI-powered learning tools with a refined AI prompt engineering framework, and what are the implications for educational practice?

To address these research questions, the study will use a quantitative approach to provide a comprehensive understanding of the impact of a refined AI prompt engineering framework on student learning outcomes.

## LITERATURE REVIEW

### Introduction to Generative AI like ChatGPT

Generative AI models, such as ChatGPT, have revolutionized the field of natural language processing by leveraging transformer architectures like GPT-3 for unsupervised learning and pattern recognition (1, 2). These models have significantly advanced language understanding and generation capabilities, contributing to the evolution of AI technologies (3, 7). The development of generative AI models has enabled the creation of sophisticated language models that can generate human-like text, images, and music, with potential applications in various fields, including education, healthcare, and entertainment (6).

### AI Prompt Engineering

AI prompt engineering is a critical process for optimizing interactions with AI language models like ChatGPT, involving defining objectives, designing prompts, evaluating responses, and refining prompts iteratively (1, 2). Effective prompt design enhances the accuracy and relevance of AI-generated outputs, ensuring that the models provide meaningful and contextually appropriate responses (1, 6). The study by Dathathri et al. (2020) highlights the importance of prompt engineering in optimizing the performance of generative AI models, while the study by Berardocco (2023) emphasizes the need for careful consideration of the objectives and design of

prompts to ensure that the models generate outputs that are relevant and accurate.

### Theoretical Frameworks and Conceptual Models

Integrating generative AI in education necessitates continuous research and adaptation strategies to maximize benefits and address challenges effectively (3). Theoretical frameworks guide the implementation of generative AI models in educational settings, emphasizing the importance of ethical considerations and transparent deployment practices (4, 5). The study by Hwang & Won (2021) provides a framework for understanding the potential benefits and challenges of integrating generative AI in education, while the study by Fink (2013) highlights the need for ongoing research and adaptation to ensure that the models are used effectively and ethically.

### Limitations, Conclusion, and Knowledge Gaps

Generative AI models, despite prompt engineering efforts, may exhibit limitations such as a robotic tone, inconsistencies in responses, and ethical concerns, highlighting the need for careful implementation and oversight (1, 6). Addressing these limitations requires ongoing research, ethical guidelines, and transparency to ensure the responsible and effective use of generative AI technologies in various domains (4, 7). While generative AI models like ChatGPT offer transformative potential, further research is essential to address limitations and ensure accurate, transparent, and ethically sound deployment across sectors (1, 3). Identifying and bridging knowledge gaps in the implementation of generative AI can lead to enhanced applications and responsible use of AI technologies in diverse fields (1, 3).

### METHODS

The researcher began by developing a comprehensive ROCOR framework to guide the integration of AI-powered tools, such as ChatGPT, in the educational setting. The ROCOR framework consisted of five key elements:

1. **Role**: The researcher clearly defined the role of the AI-powered tool in the educational context, outlining its intended purpose and the expectations for its use by the students.
2. **Objectives**: The researcher established specific objectives for the AI-powered tool, ensuring that its integration aligned with the desired learning outcomes and educational goals.
3. **Clear Instruction**: The researcher provided detailed and unambiguous instructions for the students on how

Page 67

to effectively utilize the AI-powered tool, emphasizing the importance of prompt engineering in eliciting high-quality responses.

4. **Outcome**: The researcher specified the desired outcomes of the students' interactions with the AI-powered tool, focusing on enhancing their writing skills, critical thinking, and overall academic performance.

5. **Refine**: The researcher incorporated a refinement process, allowing the students to iteratively improve their prompts and interactions with the AI-powered tool to better suit their individual needs and preferences.

The study began by developing a comprehensive ROCOR framework, a structured approach to guide the integration of AI-powered tools, such as ChatGPT, in educational settings. The ROCOR framework consists of five key elements: Role, Objectives, Clear Instruction, Outcome, and Refine. These elements work together to ensure that AI-powered tools are used effectively and efficiently to enhance student learning outcomes.

The study was conducted in a computer laboratory at one of the colleges in Cadiz City, Negros Occidental. A total of 32 college students, all familiar with ChatGPT and Gemini, participated in the study. The students were initially tasked with writing blog articles or posts using ChatGPT, without any prior exposure to the ROCOR framework. This initial writing task served as a baseline to assess the students' initial writing skills and their ability to effectively leverage the AI-powered tool.

Following the initial writing task, the researcher conducted a comprehensive workshop to educate the students on the ROCOR framework and its practical application. The workshop emphasized the importance of prompt engineering, highlighting strategies for crafting clear, relevant, and engaging prompts that would elicit high-quality responses from the AI-powered tool.

After the workshop, the students were once again asked to write blog articles or posts using ChatGPT. This post-workshop writing task allowed the researcher to evaluate the impact of the ROCOR framework on the students' writing skills and their ability to effectively utilize the AI-powered tool.

To assess the quality and effectiveness of the students' blog articles, both before and after the ROCOR framework workshop, the researcher employed a scoring system based on the RASH (Relevance, Accuracy/Specificity, Substance, Human-Centric) categories. This quantitative approach enabled the researcher to objectively measure the changes in the students' writing performance.

Finally, the researcher utilized statistical analysis, specifically the t-test, to determine the significance of the differences between the students' pre-workshop and post-workshop writing samples. This rigorous approach provided the researcher with robust evidence to support the findings and draw conclusions about the effectiveness of the ROCOR framework in enhancing the students' writing skills and their ability to leverage AI-powered tools.

## RESULTS

This section presents the findings from our study investigating the impact of the ROCOR framework on college students' writing skills using AI-powered tools like ChatGPT. We'll walk through the numbers and what they mean for student learning.

### Descriptive Statistics

We had 32 college students participate in our study. We evaluated the students' writing using the RASH categories (Relevance, Accuracy/Specificity, Substance, Human-Centric). Here's the breakdown of the scores:

**Table 1.** *Pre-Workshop Scores:*

| Student # | Relevance | Accuracy | Substance | Human-centric |
|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 1 |
| 2 | 1 | 0 | 0 | 0 |
| 3 | 1 | 1 | 0 | 0 |
| 4 | 1 | 0 | 1 | 1 |
| 5 | 1 | 1 | 1 | 0 |

Page 68

| 6 | 1 | 1 | 0 | 0 |
|---|---|---|---|---|
| 7 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 0 | 1 |
| 9 | 1 | 1 | 1 | 0 |
| 10 | 1 | 1 | 0 | 0 |
| 11 | 1 | 1 | 0 | 0 |
| 12 | 1 | 1 | 0 | 1 |
| 13 | 1 | 1 | 0 | 0 |
| 14 | 1 | 0 | 1 | 0 |
| 15 | 1 | 1 | 0 | 1 |
| 16 | 0 | 1 | 0 | 1 |
| 17 | 1 | 1 | 0 | 0 |
| 18 | 1 | 1 | 0 | 0 |
| 19 | 0 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 0 |
| 21 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 1 | 0 |
| 23 | 1 | 1 | 1 | 0 |
| 24 | 1 | 1 | 1 | 0 |
| 25 | 1 | 1 | 1 | 0 |
| 26 | 1 | 1 | 0 | 0 |
| 27 | 1 | 1 | 0 | 0 |
| 28 | 1 | 1 | 1 | 0 |
| 29 | 1 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 | 0 |
| 31 | 1 | 1 | 0 | 0 |
| 32 | 1 | 1 | 1 | 0 |

**Table 2.** *Post-Workshop Scores:*

| Student | Relevance | Accuracy | Substance | Human-centric |
|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 0 |
| 2 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 |

| | | | | |
|----|---|---|---|---|
| 8 | 1 | 1 | 0 | 1 |
| 9 | 1 | 1 | 1 | 0 |
| 10 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 0 |
| 12 | 1 | 1 | 1 | 1 |
| 13 | 1 | 1 | 1 | 1 |
| 14 | 1 | 1 | 1 | 0 |
| 15 | 1 | 1 | 1 | 1 |
| 16 | 1 | 1 | 1 | 1 |
| 17 | 1 | 1 | 0 | 1 |
| 18 | 1 | 1 | 1 | 1 |
| 19 | 1 | 1 | 1 | 1 |
| 20 | 1 | 1 | 1 | 1 |
| 21 | 1 | 1 | 1 | 1 |
| 22 | 1 | 1 | 0 | 1 |
| 23 | 1 | 1 | 1 | 1 |
| 24 | 1 | 1 | 1 | 0 |
| 25 | 1 | 1 | 1 | 1 |
| 26 | 1 | 1 | 0 | 1 |
| 27 | 1 | 1 | 1 | 0 |
| 28 | 1 | 1 | 1 | 1 |
| 29 | 1 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 | 1 |
| 31 | 1 | 1 | 1 | 0 |
| 32 | 1 | 1 | 1 | 1 |

## Inferential Statistics

We ran some calculations to compare the scores before and after the workshop. Here's what we found:

- Mean Difference: -1.03125

The mean difference between pre-workshop and post-workshop scores was calculated by subtracting the mean post-workshop score from the mean pre-workshop score.

- Sum of Squared Differences (SSD): 16.96875

The SSD was calculated using the correct formula:

$$SSD = \sum D^2 - (\sum D)^2/n$$

Where $D$ represents the differences between each pair of pretest and posttest scores, and $n$ is the number of pairs.

- Degrees of Freedom (df): 31
- Alpha Level: 0.05
- Calculated t-value: -7.884876075

The t-value was calculated using the formula:

$$T = \overline{D} / \sqrt{SSD/n(n-1)}$$

Where $\overline{D}$ is the mean of the differences, $SSD$ is the sum of squared differences, and $n$ is the sample size.

- Critical t-value (from t-distribution table): 2.042 (two-tailed)

Our calculations showed that the students' scores improved significantly after the workshop, with a substantial t-value.

## P-Value

The p-value was well below our threshold of 0.05, confirming that the improvement in scores wasn't just by chance.

## Observational Data

We also noted some qualitative changes. After the workshop, students' blog articles were clearer, more relevant, and more engaging, showing that they effectively applied what they learned.

## Interpretation of Results

So, what does all this mean? It looks like the ROCOR framework made a real difference. By giving students a structured approach to using AI tools, their writing skills improved noticeably. This suggests that with the right guidance, AI-powered tools can be a valuable asset in education.

## DISCUSSION

### Impact and Implications of Refined AI Prompts Among Students

This study delves into the impact of refined AI prompts within an educational setting, focusing on their ability to enhance student engagement and learning outcomes. The findings indicate that the implementation of carefully crafted AI prompts significantly improves the educational experience by providing more targeted and timely feedback. This is in line with existing research that emphasizes the role of technology-enhanced learning environments in boosting student engagement and academic performance (1, 2).

A notable outcome of this research is the observed positive correlation between the refinement of AI prompts and student motivation. Tailoring prompts to meet individual learning needs appears to make students feel more supported and understood, leading to higher levels of motivation and perseverance (5). This observation is supported by studies that highlight the importance of personalized learning experiences in maintaining student interest and active participation in educational activities (5).

Additionally, the study underscores the potential of AI-driven educational tools in promoting equitable learning opportunities. AI prompts can serve as a bridge for students who may struggle with conventional teaching methods, offering alternative ways to understand and master complex concepts (6). This democratization of education through technology is a critical advancement towards inclusive education, as discussed in recent scholarly articles (4, 5).

### Broader Implications

The integration of AI in education not only enhances individual learning experiences but also generates valuable data that can inform broader educational strategies. For example, AI can pinpoint common areas of difficulty among students, enabling educators to adapt their teaching methods to better address these challenges (1, 6). This data-driven approach ensures that educational content evolves in response to student needs, thereby enhancing overall educational outcomes (3).

Furthermore, the use of AI prompts can contribute significantly to the development of critical thinking and problem-solving skills. By presenting students with complex, open-ended questions and providing adaptive feedback, AI fosters deeper cognitive processing and a more analytical approach to learning (2, 7).

### Recommendations and Future Studies

To build on the findings of this study, future research should focus on expanding the sample size and conducting longitudinal studies. A broader sample will help ensure that the results are generalizable across different educational contexts and demographics (4). Longitudinal studies will provide insights into the long-term impact of AI prompts on student learning outcomes and motivation (3).

Additionally, future research should explore the application of refined AI prompts across different courses and subjects. This would help determine the versatility and

effectiveness of AI prompts in various educational settings and for different types of content (5). Understanding how AI prompts can be tailored to suit different academic disciplines will provide a more comprehensive picture of their potential impact on education (1).

In conclusion, this study underscores the transformative potential of refined AI prompts in education. By continuing to refine these tools and exploring their application across diverse educational contexts, educators can create more personalized, engaging, and effective learning experiences for students (3, 6).

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