

File S1. Prompting techniques for identification of initial research questions and their improvement

Researcher:

Give me your advice on prompting LLMs. The initial prompts are as follows:

Please look at this SWOT analysis related to the roles and scenarios we see as feasible for AI in education and academic research.

(SWOT analysis verbatim communicated to the LLM)

In the first step, you will reply as an expert in Artificial Intelligence (AI) in education. Your answers are to be based on factual information you are trained on, or the data and scientific literature you have access to. If the answer cannot be based on factual information, write "I could not find an answer." Your task is to critically evaluate the previously proposed SWOT analysis, by thinking about the educational roles and scenarios for AI, especially the Large Language Models (LLMs) and their application in education and academic research in the near future. Please use the theoretical literature and available factual information as a starting point. Use step-by-step reasoning to consider each of the proposed Strengths, Weaknesses, Opportunities and Threats in the proposed SWOT analysis. Please discuss critically each of the points made in our initial SWOT analysis and suggest new items for the SWOT analysis, if you evaluate that an important item has been missed.

In the second step, please provide a complete SWOT analysis, related to the educational roles and scenarios for AI, especially the Large Language Models (LLMs) and their application in education and academic research in the near future. Compare our initial SWOT matrix to your conclusion, and provide arguments and references we can find helpful to understand your conclusion.

Please use the ethnographic approach, i.e. analyze your previous responses from your own point of view as an thinking entity. Based on the literature on sociological ethnographic research and your knowledge of this methodo-logical approach, evaluate critically if the proposed analysis of the role of AI in education and academic re-search is accurate and realistic.

In the last step, use your assessment of the strengths and weaknesses of the AI ethnographic approach used in this interaction to realistically summarize your own points and lessons for human experts on how to approach the development and implementation of AI in education and academic research in the next five years. Provide critical advice for success, in a point-to-point format.

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LLM1:

To obtain optimal responses from LLMs for your study, consider these guidelines:

- **Be Specific and Clear:** Clearly define the scope of AI in education and academic research you're interested in. Specify that you're looking for a critical evaluation of a SWOT analysis related to LLMs.
- **Provide Context:** Give a brief background or context to the SWOT analysis you've provided. This helps in grounding the LLM's response in the context you're studying.
- **Request Critical Evaluation:** Ask for a step-by-step critical evaluation of each point within the SWOT analysis. Encourage the LLM to use its extensive training data and any relevant literature it has been trained on.
- **Ask for Additional Insights:** Prompt the LLM to suggest any new items that might be missing from the initial SWOT analysis, based on its knowledge base.
- **Request Ethnographic Perspective:** To leverage an ethnographic approach, instruct the LLM to analyze from its point of view as an AI entity, reflecting on its responses and considering the sociological and ethnographic dimensions of AI's role in education.

- **Summarize and Provide Advice:** Finally, ask the LLM to summarize its findings and provide critical advice for the development and implementation of AI in education, pointing out the strengths and weaknesses of the AI ethnographic approach used.

By structuring your prompts in this way, you're guiding the LLM to not only critically evaluate the SWOT analysis but also to consider broader implications and provide actionable insights.

Researcher:

Give me specific instructions how the improved versions of the previously communicated prompts should look like (ready to be pasted into the LLM chat interface).

LLM:

Here are the improved versions of the prompts, structured for clarity and specificity, ready to be used in the LLM chat interface:

Prompt for Critical Evaluation of SWOT Analysis

"Please critically evaluate the following SWOT analysis related to AI in education and academic research, focusing on Large Language Models (LLMs). For each point in the SWOT (Strengths, Weaknesses, Opportunities, Threats), use your knowledge base and any relevant scientific literature to provide a step-by-step reasoning. If you identify gaps or additional items that should be included, please suggest them. Refer to specific examples or literature where possible."

Prompt for Ethnographic Perspective Analysis

"Analyze the role of AI, especially LLMs, in education and academic research from an ethnographic perspective, considering your previous responses. Reflect on the sociological and ethnographic research methodologies and assess if the proposed SWOT analysis accurately captures the realistic applications and implications of AI in this field. Highlight any discrepancies or confirmations with your reasoning."

Prompt for Summarizing Findings and Providing Advice

"Based on your assessment of the strengths and weaknesses of AI in education, including the ethnographic approach used in our interaction, summarize your findings. Offer critical advice for the development and implementation of AI in education over the next five years. Your advice should be actionable, based on the analysis performed, and presented in a point-to-point format. Focus on key lessons for human experts aiming to navigate the challenges and opportunities of AI in educational settings."

These prompts are designed to guide the LLM through a structured analysis, encouraging it to draw on its training data and literature knowledge, while also providing insights from an AI perspective.