A use case of ChatGPT in a flipped medical terminology course

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Introduction

Large Language Models (LLMs) are advanced deep learning models trained on extensive text data to understand, generate, and manipulate human-like language. These models are commonly deployed in the form of a chatbot, with which users can interact in natural language and harness their multifarious abilities. In education, LLMs are increasingly being utilized for various tasks ranging from curriculum development and assessment to writing assistance. Learning methodologies have evolved to incorporate LLMs, leveraging their instant feedback and personalized guidance to enhance understanding and address misconceptions [1]. The ability to generate dynamic text tailored to individual queries contrasts with the traditional reliance on static text, facilitating a shift in learning behavior. This allows for deeper exploration through the pursuit of cascading questions, fostering a more interactive and personalized learning experience [2].

In this vein, this paper presents a specific application of LLMs in a flipped classroom setting for a medical terminology course. The course, designed for first-year premedical students, concentrates on mastering medical terms and concepts. To encourage active learning and critical thinking, the course employs a flipped learning approach. Instead of traditional lecture–style teaching, students are assigned particular lessons within a chapter to research and present in small groups. These presentations become the core of classroom activities, delivering basic knowledge and stimulating interactive discussions and question–and–answer sessions to enable deeper comprehension of the material. Notwithstanding its advantages, flipped classrooms can present challenges for students, particularly with achieving lower-order learning goals due to lack of guidance and immediate feedback during self–learning [3]. To mitigate these difficulties, comprehensive prompts along with step-by-step instructions are provided, helping students harness the capabilities of LLMs to enrich their flipped classroom preparation experience.

Subsequent sections will detail the prompts and
instructions given to students and explore how LLMs, such as ChatGPT, can be integrated into learning activities. This study aims to provide educators with insights into the adaptation and implementation of these methodologies within their specific contexts.

**Student guidelines**

In the guidelines, several leading LLM–based chatbots available as of July 2023 are introduced, including Google Bard, Microsoft Bing Chat, OpenAI ChatGPT, and Anthropic Claude. Acknowledging the unique strengths and limitations inherent to each chatbot, students are encouraged not only to experiment with ChatGPT, but also with other platforms for a comparative learning experience. One significant hurdle when integrating LLMs into education is their tendency for hallucination, a phenomenon where outputs may deviate from factual accuracy or provided context [4]. To counteract this, students are advised to cross-verify any potentially aberrant responses against their textbooks. The guidelines also highlight the inherent unpredictability of LLMs, which can generate a variety of responses to the same prompt. Students are therefore encouraged to exploit this characteristic by generating multiple responses to a single query or subtly altering their questions. To facilitate the effective use of these chatbots, the guidelines provide five distinct prompts along with strategies on interpreting and working with the generated content.

1. **Prompt 1. Generate study material**

   "I want to give a 15-minute pharmacology lecture for college students about the following contents. Use relative concepts and a comparative approach to explain. Provide a summary table in the end.
   
   Title: Gastrointestinal drugs (lesson unit title)
   
   Contents: antacids, antiulcer drugs, gastroesophageal reflux disease, cimetidine, omeprazole, antidiarrheal drugs, cathartics, laxatives, purgatives, antinauseants, anti–tumor necrosis factor, autoimmune diseases, Crohn’s disease (keywords listed in the textbook)"

   The initial instructions guide students on effective techniques for engaging with LLM–based chatbots. Students are advised to include contextual details during their requests, such as specifying a 15-minute study session, indicating the subject matter like pharmacology, and outlining the intended audience, such as university students. Learning new concepts can be enhanced by adopting a comparative approach, by engaging students into a mental process that involves identifying similarities and differences [5]. To augment understanding and recall, students are instructed to ask the chatbot for a summary table of the key content. An essential aspect of this approach involves cross-checking the information obtained from the chatbots against standard textbooks. If a chatbot’s output diverges significantly from the textbook’s content, students should consider regenerating responses or tweaking the prompt. LLMs can serve as invaluable tools to supplement textbook descriptions, particularly in providing detailed explanations of complex concepts. Students are recommended to ask follow-up questions if they encounter unfamiliar terms or unclear passages. As an effective study method, conducting an in–depth exploration triggered by a single keyword is also encouraged, allowing students to delve deeper into particular topics.

2. **Prompt 2: studying terminology**

   "Make a table for the most important keywords in this lecture. Use the columns ‘keyword,’ ‘etymology,’ ‘meaning,’ ‘example.’”
The subsequent instructions guide students on generating study material specifically for mastering terminology within the lesson. Given that many medical terminologies originate from Latin or Greek roots and often include prefixes and suffixes, students are recommended to request the chatbot to provide the etymology of the key terms. This method serves as an efficient way to familiarize oneself with new words. Additionally, students are encouraged to ask the chatbot for example sentences using the new terminology, which aids in understanding these terms in their appropriate context.

3. Prompt 3: identifying key points

“What are the three most important points in this lecture?”

The inability to discern what information is important while learning a new field can pose significant challenges during self-study [6]. With the assistance of LLMs, students can approach these challenges strategically. By asking what the most important points are, students can leverage the capabilities of LLMs to act as personalized tutors that highlight the most crucial content within a given chapter. Furthermore, students are advised to incorporate this synthesized information into their summary slides for presentations. This serves to promote effective communication and presentation skills alongside a deepened understanding of the subject matter.

4. Prompt 4: fostering enhanced cognitive engagement

“What are five questions students may ask after this lecture? Provide detailed answers.”

A common occurrence in flipped classroom settings is students appearing perplexed or disengaged when asked for “any questions or comments” following a lecture [7]. To circumvent this challenge and inspire a greater level of intellectual curiosity and critical thinking, LLMs can be harnessed to generate thought-provoking questions related to the subject at hand. Asking LLMs for hypothetical questions can yield a wealth of stimulating queries that can catalyze engaging classroom discussions. This strategy helps spark curiosity and critical thinking among students, making them active participants in learning, and not just passive recipients of knowledge.

5. Prompt 5: constructing a presentation outline

“Make a concise outline suitable for a 15-minute PowerPoint presentation.”

In the final set of instructions, students are guided towards creating a draft for their presentation using LLMs. As the chatbot can utilize context from previous user interactions, a straightforward prompt such as the one above can yield an appropriate presentation outline tailored to the subject matter at hand. The guidelines also provide additional tips for customizing the output to suit their needs. For instance, changing 15 to a different number may modify the granularity of the content. Furthermore, requesting for addition or removal of specific content can be used to fine-tune the material to the student’s satisfaction, ensuring a coherent presentation.

Conclusion

This article portrays the implementation of LLMs in a flipped classroom setting for a medical terminology course, wherein students were given prompts that leveraged the capabilities of these models to support their study process. These prompts were crafted to generate
study materials, support the learning and understanding of complex medical terminologies, highlight key concepts, stimulate curiosity and critical thinking through question generation, and assist in the development of presentation materials.

However, it is important to acknowledge the unique challenges posed by the introduction of LLMs into educational settings. One such challenge is the models’ tendency for hallucination, or producing outputs that may be contextually irrelevant or factually inaccurate. To counter this, students need to maintain a vigilant approach by cross-verifying the information provided by LLMs with their textbooks. A more technical solution to this issue could be the use of a specialized chatbot that provides answers to student questions based on established study materials, potentially minimizing factual inaccuracies [8]. Furthermore, there are legitimate concerns regarding the potential misuse of LLMs in academic settings, including instances of cheating and overreliance [1]. Instead of addressing these concerns through prohibitions on the use of LLM tools, it is pivotal that educators enhance their artificial intelligence (AI) literacy and teach students the proper way to incorporate these tools into the learning process [2].

Another critical point is that curricula often lag behind the rapid advancements in AI due to the lengthy process of updating academic syllabi. The indirect introduction of new technology, as exemplified in this paper, provides a viable method for exposing students to recent AI developments without needing immediate changes to the curriculum.

The benefits of integrating LLMs into education, fostering an active learning environment, and enhancing student engagement, present significant advantages that can help transform the educational landscape. The concrete example provided in this article demonstrates a tangible way to integrate LLMs into the educational setting, which may seem abstract to many educators. In conclusion, it is recommended that educators proactively enhance their AI literacy and examine the potential of integrating technological advances into the teaching process.

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References