

Coexisting with artificial intelligence in the classroom

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INTRODUCTION

Artificial intelligence (AI) has the potential to impact almost all aspects of our lives. Education will not be exempted from this. It is useful to consider the impact of artificial intelligence so that we can better prepare our students for a world in which AI, like many other aspects of technology, is used to enhance performance.

Teachers play a central role in education, and for the moment, that appears to continue. It is important to focus on the three key tasks of a teacher in education. A teacher must create the best learning environment for their students. As the student progresses through this environment the teacher must provide guidance in the form of feedback to assist the students in their progress. Finally, the teacher must model professional behavior, as role modeling is a key aspect of professional development. If you take a moment to reflect on a teacher who has impacted your life, these three characteristics are likely present.

Technology has always disrupted education. The oral tradition of prehistory was the only form of teaching, learning directly from the teacher. This form of teaching was disrupted by the development of writing, where the information could now be separated from the source. Libraries collected these written works, greatly increasing the knowledge fund contained within their walls. The printing press removed the tedium of transcribing manuscripts, making books more easily available. The technologies of photography and projection allowed first still and later moving images to be captured, stored, archived, and shared. The last half of the 20th century saw two major technological impacts, as analog recordings gave way to digital recordings and digital data was widely disseminated through the Internet.^[1] Now it is AI's turn, and AI has the potential to be as transformative as the technologies listed above.

Graduate Education

The scientific method is at the core of graduate physiology education, as physiology is first and foremost an experimental subject. Currently, graduate students are guided in the steps of the scientific method, and doctoral programs culminate with a dissertation incorporating all these steps.

A Chinese software company, Chengdu Techman, has recently unveiled an AI-enabled data collection and management

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system.^[2] As part of the data collection, investigators identify the comprehensive experimental design, including the treatment groups and the number of subjects in each group. As the data is collected, the information is sorted and stored based on the experimental design. At this point, artificial intelligence is activated.

The artificial intelligence then compiles the data, conducts multiple statistical analyses of the data, graphs the data in both the recommended and alternative formats, drafts the entire manuscript, and recommends journals that would be appropriate for submission.

Consider for a moment the balance of time in a graduate program between the hypothesis generation and the analysis of the data, including the writing of manuscripts. Should this promise of AI be realized, graduate education will shift the emphasis away from data analysis and toward hypothesis generation. This will require a significant change in how graduate education is currently approached.

Much like other aspects of technology, the user must decide what is appropriate. For example, students who do not participate in the statistical analysis and graphing of the data, as well as drafting the manuscript, may not fully appreciate how to critically review the AI output. This critical review is essential as AI currently is prone to mistakes. It remains to be determined whether the incorporation of this level of AI into the laboratory becomes the standard.

Medical Education

The direct impact of AI on physiology teaching in medical programs is unclear. What is clear is that AI will change how physicians practice, and our role as instructors is to prepare students to function in an AI-enabled world.

Undergraduate medical education has adopted a competency-based approach used in graduate medical education. Competencies are defined in terms of knowledge, skills, and attitudes or behaviors. Historically, knowledge (including causal reasoning as the foundation for diagnostic reasoning) has been the defining competency of a physician. Physiology instruction, like most foundational sciences, has focused on knowledge and causal reasoning.

As medical education aligned with clinical training, foundational courses shifted to learner-centered teaching approaches, with instruction integrated across the foundational courses. Knowledge remained a focus, but also course outcomes extended into the application of that knowledge in a clinical context.

Studies show that AI can reduce the time a physician spends on documentation by more than 50%, and that additional time is spent interacting with the patient.^[3] To adapt to the presence of AI, undergraduate medical education must increase its emphasis on skills and attitudes. Medical practice has already been impacted by other technology changes, as healthcare consumers turn to the Internet as a source of information. AI is going to accelerate this transition. As instructors, we need to prepare our students to interact with consumers already diagnosed by AI, and the physician's task will be to use their knowledge, skills, and attitudes to critically evaluate the accuracy of the AI diagnosis.

CONCLUSION

During the industrial revolution, users were familiar with mechanical engines, as troubleshooting and repair by the user was the norm. Now machines are tools. Much like current automobile drivers do not understand the workings of the internal combustion engine, future generations of professionals may rely on AI to complete many tasks currently done by the users. As teachers, we need to better understand the benefits and limitations of AI systems so that we can prepare our learners to function in an AI-embedded world.

CONFLICT OF INTEREST

I was a sponsored speaker at a 2024 symposium sponsored by Chengdu Techman.

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