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The Future of Medical Education: Flipping the Classroom and Education Technology

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The future of medical education lies in technology. The cost and efficiency technology allows represent a paradigm shift in how we teach and utilize faculty, space, finances, and other resources. New goals for future practitioners have arisen as we promote additional responsibilities in an ever-changing field.

A 2014 survey conducted by The Ohio State University College of Medicine identified the most important aspects of medical school training as (1) clinical problem solving, (2) learning how to acquire knowledge, (3) developing bedside manner, (4) teamwork, (5) technology training, and (6) clinical research.[1] This list is in general accordance with the opinion of practitioners in the medical field at large[2,3] and the Association of American Medical Colleges.[4] This list of skills is also reflected in the milestones set forth by the Liaison Committee on Medical Education.[5]

Training physicians with these skills requires a divergence from traditional methodology. However, most administrators, instructors, and providers have been in a stable environment that has seen little change in the past 40 years. Those who created the system are not likely to disrupt it.

One innovation being implemented in the basic sciences is the flipped classroom. In the flipped classroom, students prepare for class by doing prework at home, often in the form of a video lecture. They then come to the classroom to solve cases and practice problems, engage in teamwork, and gain familiarity with researching answers. Some educators champion the flipped classroom as the next frontier of medical education.[6]

This model of case-based learning in small groups naturally facilitates many of the elements that students and teachers deem important in medical school. Students come prepared with some material, but the cases are more complex than simple memory recall—they are problems that must be solved and can mirror clinical practice.[1] The expertise required to solve the case is rarely completely covered by the prework, so students must turn to alternative resources to get their answer and learn how to acquire knowledge.[2] Small groups naturally facilitate teamwork, as students in the group have different strengths and weaknesses in knowledge and skills.[4] While not necessary, supplying students with tablets and smartphones allows them to interact with technology to achieve their goals.[5] The only skills that are not taught with this form of instruction are developing bedside manner (skills appropriate for clinical ward experience) and clinical research.

The strengths of the flipped classroom are best illustrated by considering the alternative. In the traditional education model, students come to the lecture hall without preparation. The lecturer gives a one-size-fits-all lecture from start to finish. Upon completion, every student has a question, but each is different. Along the way, each student turned to some distraction and missed an element of the lecture. This model has no interaction, teamwork, leadership, technology, or thought on how to maintain continuing education. At best, students now know what was in the lecture but will forget all but 20% of it tomorrow.[7] However, with prework, students watch a lecture in an environment of their choosing at their own pace. Students can review the concepts they do not understand as needed. They then come together to drive beyond the basics to develop skills that cannot be taught in a lecture.

Technology is making this learning model possible, scalable, and customizable. Material can be offered à la carte, fitting the busy schedules of adult learners juggling clinical and classroom expectations. The best educators, once constrained to a classroom of a few hundred, can now reach thousands of students. Platforms can offer multiple learning modalities in one location.

The type of prework assigned is crucial to the success of the flipped classroom. Telling students to read a chapter or watch a video before coming to class is insufficient. The content needs to be engaging, to adhere to adult learning behavior, and to accommodate more than one study strategy. For example, visual and auditory learners should do well with video content, whereas reading/writing learners may prefer written notes. Kinesthetic learners may want to deal with problems and vignettes as preparation. Thus, a prework for all comers cannot be a one-size-fits-all lecture either. Rather, a combination of reading and viewing material, questions, and cases is necessary to facilitate all learning strategies.

While this thinking is making its way into medicine,[8] there is still much reluctance to change. Real barriers exist. The initial cost of producing such content is expensive in dollars and time. Concerns exist about the ability to host the content and to scale its access. Universities often store material on their networks, limiting stability and accessibility beyond their students. This practice leads to multiple people building similar resources multiple times.

However, the benefits of excellent prework cannot be overstated. Once complete, the assignments exist in perpetuity, requiring only occasional updates as recommendations change. Free resources such as YouTube and

Weebly give content creators free, stable, and open platforms without hosting costs. Scale and influence can be magnified quickly.[9] Commercial resources also exist, negating complexities and costs associated with the construction and management of content.[10]

It is important to state that the flipped classroom cannot be the only form of education. Medicine is still very hands-on, and nothing can replace that experience. There must be clinical time in medical school. Residency cannot be hastened. Thus, the flipped classroom and case-based instruction cannot be the only form of instruction. However, this model represents a potential future as a means for improved instructional efficiency. The flipped classroom can enable students to be better prepared for the clinical experience so they can go further in their training, rather than catching up to where they're supposed to be.

Nothing will replace seeing a patient; clinical experience and human interaction are too important to the practice of medicine. However, by pushing students to learn essential medical knowledge and build skills and abilities beyond information recall, the flipped classroom represents a promising modality in medical education.

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