Flipping the Medical School Classroom

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INTRODUCTION

Teaching and learning in medical schools and institutions is a multifaceted endeavor, especially as the United States' health care system continues to become more complex. Medical students need to develop a rich foundation of not only content knowledge, but also problem solving and technical clinical skills. However, due to various barriers such as inadequate or limited clinical placements, an unpredictable learning environment, and duty hour time restrictions (Feng et al, 2013; McLaughlin et al., 2014; Tainter et al, 2016), medical students may develop gaps in knowledge that could impact their future success. To circumvent these gaps, medical education programs must be innovative in how they deliver core content knowledge. Historically, lecture-based didactics permitted learners to be passive in the acquisition of knowledge, while teaching faculty were recognized as a "sage on the stage" (King, 1993). The role of "sage on the stage" is considered to be the keeper of knowledge and who considers students as empty vessels that need to be filled. This archaic method of interaction and learning is not appropriate in the preparation of today's 21st century medical student (O'Brien & Irby, 2013).

Educational opportunities should be provided in a manner that is learner-centered and innovative to further increase student engagement and deeper comprehension of the required medical knowledge (Irby, Cooke, & O'Brien, 2010; Prober and Heath, 2012). Suggestions from Irby, Cooke, and O'Brien (2010) assert four goals that are imperative for the future of medical education:

1. Standardization of learning outcomes and individualization of the learning process,
2. Integration of formal knowledge and clinical experience,
3. Development of habits of inquiry and innovation, and
4. Focus on professional identify formation (pg. 5-6).

With these objectives in the forefront, educational theories and practices must be revisited, tailored, in order to improve and evolve current pedagogical practice.

Rapid advancements in technology, both of software and hardware, have encouraged e-learning to emerge as a key component in curricular development, especially in the field of medical education (Dankbaar & de Jong, 2014). Students can now access and interact with required readings, cases, models, videos, simulations, and collaborate with peers across the country or the world. Remarkably, e-learning has allowed educators to "mobilize" their teaching practice and provide content at any point in time, from any location (Jashapara & Tai, 2011). However, there are always challenges when attempting to develop and implement a new e-learning strategy while simultaneously integrating face-to-face contact. Thus, how does an educator integrate both e-learning and face-to-face learning in a balanced

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and engaging way? This article synthesizes the method of flipped lectures or flipped learning and presents practical strategies to implement flipped learning within the unique medical education setting.

BACKGROUND

The flipped lecture, flipped learning, or inverted classroom originates from K-12 education (Bergmann & Sams, 2012) and provides students with the opportunity to interact with content prior to entering the classroom in a structured, organized way (see figure 1) (Barett, 2012; Mazur, 2009; O'Flaherty & Phillips, 2015; Lage, Platt, & Treglia, 2000). Flipped classrooms stemmed from the Khan Academy, conceived in 2006 by Salman Khan which provided access to 3200 videos and 350 practice exercises which were used by teachers for flipped classrooms (Bishop & Vergler, 2013).

From there, flipped lectures have steadily grown in popularity following a distinct curricular design. First, students participate in the asynchronous event, commonly recognized as an online component. This typically involves a module with videos, podcasts, interactive readings, reflective questions, and/or chatrooms (Prober & Health, 2012, Sharma et al., 2015). Then, during the face-to-face class time, or synchronous event, students participate in active learning and implementation of new knowledge. Flipped learning is *not* simply assigning homework or readings and then conducting teacher-led lectures. Rather, flipped learning incorporates a diverse amalgam of technology, literature, and inquiry to establish a critical knowledge base prior to engaging with the content on a higher level of learning. In turn, the learning environment becomes personalized, engaging, and content rich, thus improving the ways in which students apply abstract knowledge to solve realistic problems (Bergmann & Sams, 2012; Mann, 2011; Sharma et al., 2015).

Flipped lectures have been found as a successful method to engage students. In a study by Lew (2016) 46 medical students enrolled in an emergency medicine clerkship much preferred the flipped lecture to a more traditional lecture-based classroom. Furthermore, the students in this study remarked on the advantage of the interactivity and medical decision-making. Interestingly, Lindeman et al (2015) discovered with the implementation of flipped lectures, surgical students did not perform any better on the National Board of Medical Examiners (NBME) examination, but that students did give a higher satisfaction rating at the conclusion of their clerkship. Similarly, Liebert et al (2016) found comparable results, when investigating student NBME results from both the flipped lecture to those in the traditional classroom, there was no statistical difference. Notably, student satisfaction of the flipped lecture was higher than the traditional lecture-based classroom with individuals reporting a greater interest in surgical specialties after the clerkship.

Those who support flipped learning have found that this instructional method has a number of benefits (O'Flaherty & Phillips, 2015; Sharma et al., 2015). First, by implementing flipped learning, students learn at their own individualized pace, which is appropriate to their learning style and need. Additionally, students can take advantage of repetition and repeated exposure to the content by pausing or revisiting the material as needed (Pierce & Fox, 2012). Upon entering the physical classroom, students have a foundational knowledge of the required content. This is essential as students and educators now have the space to engage in robust discussion regarding complex cases, problems, and issues. This interactivity also provides for immediate feedback and evaluation (Sharma et al, 2015) to both student and educator regarding what additional knowledge gaps exist. Furthermore, this flipped model encourages students to take ownership of their learning as they are required to be prepared to actively engage to solve problems and address cases.

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