Student Learning Tool Usage and Preferences in a Medical Microbiology Course: A Quality Improvement Study

Jennifer L. Kisamore, Ph.D., University of Oklahoma-Tulsa

Earl L. Blewett, Ph.D., Oklahoma State University-Center for Health Sciences

Abstract

Background: Instructors of Medical Microbiology have developed various tools to help students learn basic properties and principles of infectious agents as related to health and disease. The goal of the current quality improvement study is to assess student use and preferences among these tools for learning course content.

Methods: Students enrolled in Medical Microbiology during spring 2019 completed an anonymous, online survey regarding learning tool use and preferences. Of the 123 students enrolled in Medical Microbiology, 61 (49.6%) completed the survey.

Results: Results suggest that of instructor-developed tools, most students used lecture slides alone (75.86%) and streamed lectures (75.86%). Fewer students used course notes (58.62%), in-person lectures (44.83%), and micro board review materials (14.29%). Qualitative responses indicated that students preferred streamed lectures over in-person lectures due to the greater flexibility of streaming lectures given that streamed lectures could be viewed at a time convenient for the student and sped up, slowed down, and replayed depending on the student's level of understanding of specific topics covered in that lecture.

Conclusions: Respondents preferred sources such as lecture slides and streamed lectures that conveyed concepts the instructors deemed to be most important but that also allowed them to learn at their own pace and on their own schedule. Future research is needed to assess whether students' perceptions regarding the utility of resources match actual effectiveness of knowledge transfer.

Introduction

Medical Microbiology is a required introductory course for first year medical students at Oklahoma State University Center for Health Sciences College of Osteopathic Medicine (OSU-CHS). The course is designed to teach first year medical students about the properties, transmission mechanisms, and pathogenesis of viruses, bacteria, fungi and parasites. The course emphasizes basic properties and principles of infectious agents as related to health and disease. This course serves as a first step for medical students in a lifetime study of disease processes.

In spring 2019, four faculty members facilitated the course's 45 lecture sessions which lasted 50 minutes each. Since 2018, the Medical Microbiology faculty have made online lectures available to augment the live lecture sessions as well as other instructor-developed and external learning tools. The current study is a quality improvement project designed to assesses student preferences and utility perceptions regarding Medical Microbiology course learning tools. Results can guide instructors' development and use of future course resources.

Online lectures have been widely integrated into medical education.[1] Learners can reap benefits from the availability of online lectures including improved exam performance and increased speed of knowledge acquisition.[2,3,4] Unlike live lectures, online lectures allow students to control the speed of information delivery, slowing down or accelerating the pace of instruction. Given the high demands on their time, Cardell and colleagues found medical students tend to view online lectures at 1.67 speed which allowed them to view a 60-minute lecture in 36 minutes.[3]

While studies have been conducted to examine the efficacy of various teaching tools including online lectures among medical students, no such study has been conducted regarding the use of streamed lectures in the Medical Microbiology course offered at OSU-CHS. The current study seeks to examine the efficacy of learning tools used in Medical Microbiology and to compare findings from this course with extant research.

Method

Procedures followed were in accordance with the ethical standards of the OSU-CHS Institutional Review Board. Given it is a quality-improvement study, the OSU-CHS Institutional Review Board deemed this project to be exempt (#2019042).

Participants

Students enrolled in the spring 2019 Medical Microbiology course were surveyed in April 2019 via Qualtrics. All 123 students enrolled in Medical Microbiology were invited to participate; 61 students responded to the survey yielding an effective response rate of 49.6%.

Measures

A 37-item survey was developed by both authors. The 27 close-ended questions included a mix of multiple choice, ranking and rating questions which asked respondents about their use of and perceptions regarding both instructor-developed learning tools (e.g., in-person lectures, streamed lectures, course notes, lecture slides alone, Micro board review material) and externally-developed resources (e.g., course textbook, Sketchy Micro, Kaplan Comlex review). Ten open-ended questions asked respondents to elaborate on their replies to the close-ended questions. A sample question is "Please indicate why you attended live lectures and the benefits you found in learning the material in a live lecture format."

Results

Frequencies were computed using the analysis tools built into Qualtrics. Excel was used to compute other descriptive statistics including means and standard deviations.

Instructor-Developed Resources

Usage. Respondents indicated using streamed lectures much more frequently than the in-person lectures. While 54.10% of respondents indicating watching between 81 and 100% of lectures online, more than half (50.82%) of respondents indicated attending between 0 and 20% of the live lectures. As shown in Figure 1, when asked about their usage of each of the instructor-provided resources, respondents indicated using lecture slides alone and streamed lectures most frequently followed by course notes, in-person lectures, and micro board review material.

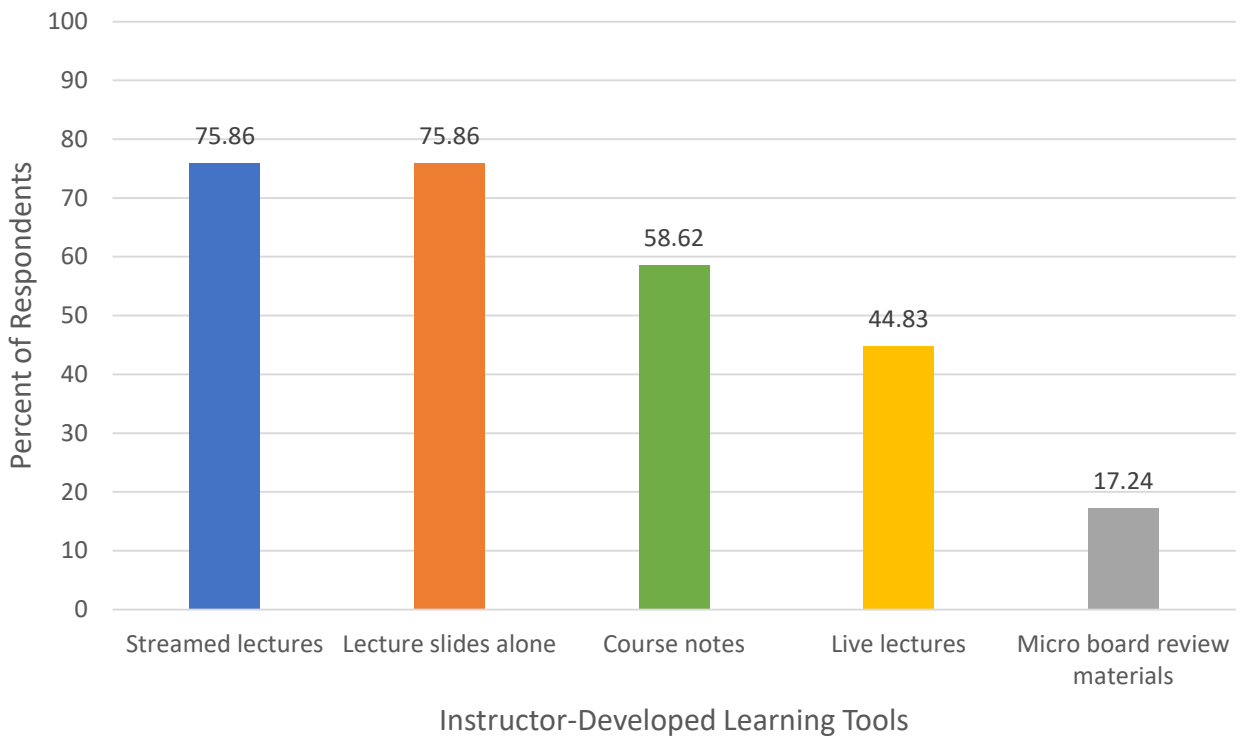

Figure 1. Percentage of respondents who indicated using each type of instructor-developed learning tool.

We were also interested in whether students use the streamed lectures to augment live lectures or as a substitute for them. We asked respondents to indicate how they learned content related to six specific topics (e.g., hepatitis viruses, staphylococcus). As shown in Figure 2, results suggested that for the six topics selected, students were more likely to use the streamed lectures in place of live lectures rather than as a tool to augment live lectures. There, however, was a notable number of students who only attended live lectures or who used both live and streamed lectures. Some students indicated not using either lecture format to learn course content; the remaining students could not recall how they learned content related to specific course topics.

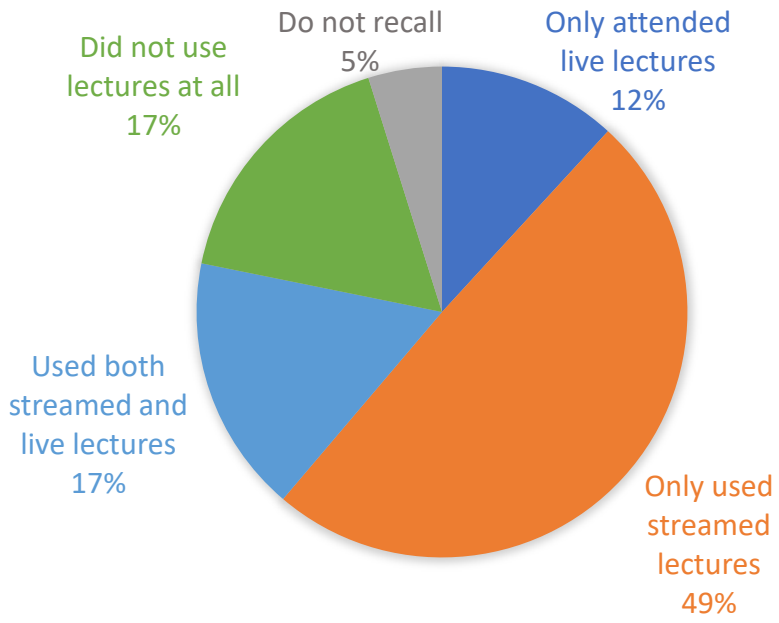

Figure 2. Percentage of respondents who used streamed and live lectures.

Perceived usefulness. Respondents were also asked to rank the five instructor-provided resources in terms of their usefulness for preparing for course exams. The resources were ranked from 1 to 5 with a rank of 1 indicating the respondent perceived that instructor-provided resource to be the most useful of the five resources provided. Thus, lower rankings indicated greater perceived usefulness. Lecture slides alone were ranked as most useful (m_{rank}=2.09) followed by streamed lectures (m_{rank}=2.71), course notes (m_{rank}=2.98), micro board review materials (m_{rank}=3.59), and in-person lectures (m_{rank}=3.64). Rankings suggest that students regarded resources that allowed them to control the pace and timing of learning as most useful. See Figure 3 for a detailed depiction of rankings of usefulness.

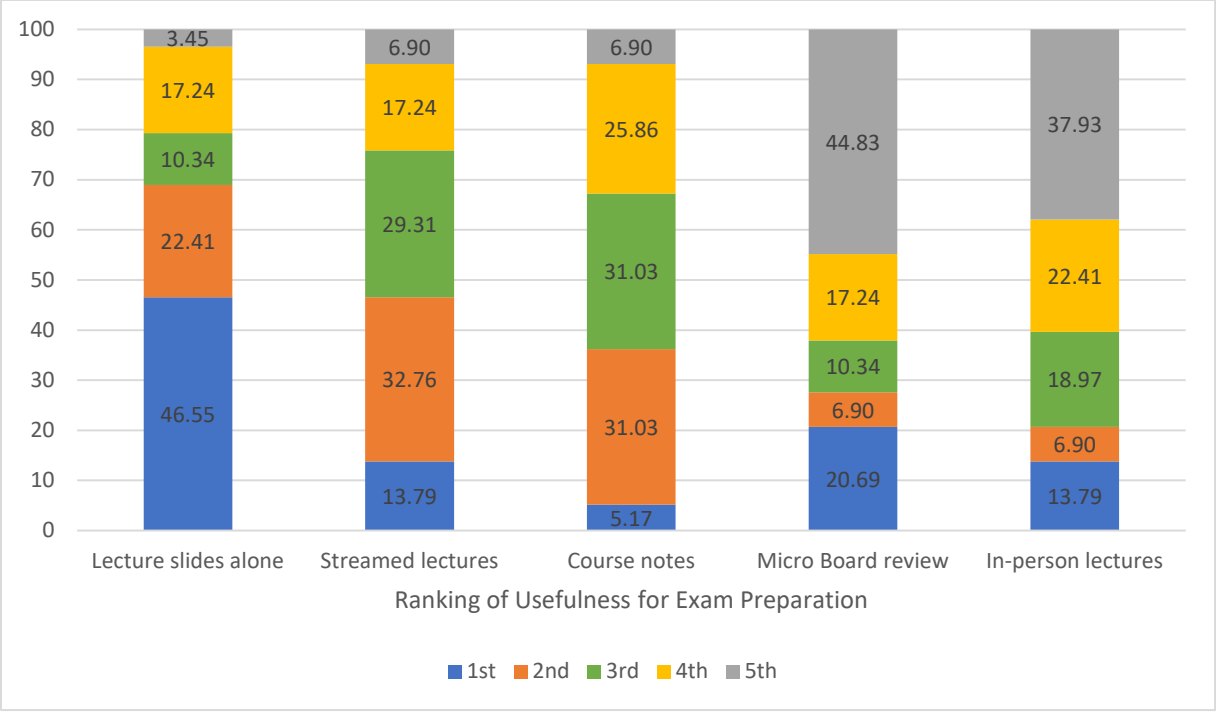

Figure 3. Rankings of usefulness for exam preparation. Darker colors correspond to greater perceived usefulness for exam preparation.

Open-ended responses. We asked students to elaborate on their responses regarding why they used or did not use specific resources. Students who attended the live lectures said they felt more engaged by the in-person lectures than the streamed ones, used the live lectures as a first exposure to the material, were able to get a better sense of what instructors were likely to ask on exams, and felt a duty to attend out of respect for faculty members. Students indicated live lectures could be improved by including more active learning techniques such as having students apply or discuss the topics.

For streamed lectures, respondents overwhelmingly indicated the ability to pause, rewind or speed up lectures as the major benefit of using recorded lectures (95.45%). Students indicated use of streamed lectures helped them minimize distractions inherent in large classes, allowed them to have multiple exposures to the material, and allowed them to watch lectures at times and in blocks they felt were more conducive to learning than the scheduled 50-minute morning lecture blocks. Students had few suggestions for how to improve the streamed lectures other than to make the pointer show up on streamed slides.

External Resources

Course instructors also required or recommended some externally developed resources. Overall, students reported using external resources sparingly, if at all. *Sketchy Micro* was a notable exception even though it was not required. Most students (91.8%) indicated using it and rated its usefulness as 90.39% (s=14.91). On the other hand, despite being a required external resource

and open-source, only 13.11% of respondents indicated using the course textbook; this however is, consistent with other research that shows course textbooks are not a preferred learning tool by current medical students.[5] Of the respondents who did use the textbook, the average usefulness rating was only 42.75% (*s*=19.91). One respondent indicated using *Medical Microbiology Made Ridiculously Easy* while zero respondents indicated using the Kaplan Comlex review. Seven respondents indicated using "other" external resources; the most common write-in responses were *First Aid*, *Boards and Beyond, and Anki flashcards*.

Discussion

Results of the current assessment are consistent with extant research which shows online lectures allow medical students greater flexibility and control when learning material and may accelerate their knowledge acquisition. As stated by Cardell and colleagues, although educators may be uncomfortable with the fundamental change in the learning process represented by video-recorded lecture use, students' responses indicate that their decisions to attend lectures or view recorded lectures are motivated by a desire to satisfy their professional goals.[3] That is, low classroom attendance does not necessarily translate into lack of knowledge acquisition but instead suggests students prefer to learn content in a manner that allows them to individualize the speed with which they are presented information based on their level of pre-existing knowledge.

Results of the current study mirror findings by Sturman and colleagues who asserted "students have a choice of learning resources, both provided by faculty and sourced elsewhere, and spend time on the resources that they perceive to be the best value proposition for their learning."[6(p22)] Current Medical Microbiology instructors should note that previous work has shown medical students tend to prefer short 15 to 30 minutes online lectures.[4,6] Thus, future recorded lectures may best be formatted in shorter blocks to allow students greater control over the pace of information transmission.

Conclusion

Overall, medical students face intense learning demands and students learn at different rates. Students desire time-flexible resources for learning course content. The current study relied on student reports regarding resource utilization and effectiveness. Future research is needed to assess the efficacy of course resources for actual knowledge transfer and retention.

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Declarations

Original publication: The manuscript is original and has not been previously published. The current manuscript is based on a poster that was presented at the 2019 Oklahoma Academy of Sciences, Edmond, OK. The poster was entitled "Medical students' preferences for learning course content."

Conflicts of Interest: Dr. Earl Blewett was the course coordinator for the 2019 OSU-CHS Medical Microbiology course. No other potential conflicts of interest are deemed to exist.

Ethics: Procedures followed were in accordance with the ethical standards of the Oklahoma State University Center for Health Sciences' Institutional Review Board and with the Declaration of Helsinki of 1975, as revised in 1983. The OSU-CHS Institutional Review Board deemed this project to be exempt given it is a quality improvement project.

Authorship: Both authors participated sufficiently in the work to take public responsibility for the content and integrity of the work as a whole, from inception to published article.

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