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Supplementing an Epidemiology Course with Online Lectures

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Abstract

Background: Online distance education is proving to be an effective pedagogical vehicle for enhancing learning outcomes of medical students. Epidemiology is a subject area underexplored as an appropriate content area for online delivery. We sought to determine whether online epidemiology videos were an effective companion teaching tool that could result in measurable improvements in student performance.

Methods: In partnership with the Lecturio Corporation in Germany, an online Epidemiology class created, featuring 11 recorded lectures tailored to the USMLE medical licensing requirements. Free access to the lectures was offered to the students of a 4th year undergraduate Epidemiology course at the University of Ottawa. Improvements in this group from the midterm examination baseline to the final examination performance were assessed relative to improvements experienced by students who did not watch the videos.

Results: Students who watched the videos saw their average mark increased by 1.2%, while the mark in the control group decreased by 2.6%, though this difference was not statistically significant. Qualitative comments were universally positive with respect to the instructional usefulness of the videos.

Conclusion: Augmenting traditional university epidemiology courses with an online video component is an effective strategy that can result in improved student learning outcomes, though further research is needed to determine how best to deploy such tools either in isolation or in partnership with in-person instruction.

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Introduction

Online distance education is proving to be an effective pedagogical vehicle for enhancing learning outcomes of medical and health sciences students. Prior to the COVID-19 pandemic, epidemiology was a subject area heretofore underexplored as an appropriate content area for online delivery. The pandemic accelerated the adoption of asynchronous online learning modalities, though specialist medical content, like epidemiology, are among the underexplored subject areas for this style of content delivery.

Nevertheless, the distance learning model for epidemiology is growing in popularity, and with such growth comes the need to assess the effectiveness of this modality across a number of domains [1].

Investigators of online educational modalities have remarked on how students report feeling greater independence through the creation of self-paced learning schedules [2]. The use of online materials are believed to have helped to facilitate a balance between out-of-school commitments and academia. The belief is that hybrid and online courses help students to feel more en-

gaged and motivated to study [2]. Therefore, comparable scholastic performance is to be expected among students benefiting from learning augmented with self-paced asynchronous online content.

With this study, we sought to evaluate the extent to which online repidemiology videos, developed as a standalone course, could be integrated into a traditional in-person lecture series; determine whether augmenting traditional lecture-based epidemiology learning with online videos leads to improved learning outcomes; and evaluate students' perceptions of the appropriateness and utility of the online Epidemiology videos.

Materials and methods

In partnership with the Lecturio Corporation in Germany, an online Epidemiology class was created, featuring 11 recorded lectures tailored to the USMLE (United States Medical Licensing Examination) medical licensing requirements. Lecturio is an online educational products company founded in 2008 in Leipzig, Germany.

Free access to the lectures was offered to the students of a 4th year undergraduate Epidemiology course at the University of Ottawa, in Ottawa, Canada, midway through the course, after the students had written their midterm exams.

At the conclusion of the course, participants were asked to respond to an online survey which sought to measure students' perceptions of the online course's ease of access, utility, and value. As well, participants' performance on their final exams, relative to their midterm exam marks, was assessed in comparison to students who did not access the online videos.

Permission for this study was granted by the University of Ottawa Research Office of Research Ethics and Integrity, file H09-16-09.

Results

There were 90 students enrolled in the class overall. While 40 students expressed an interest in viewing the Lecturio videos, only 26 actually did so. Of those 26, 18 provided feedback on the qualities of the videos, but performance data were available for all 26.

Those who viewed the Lecturio videos started with a mean midterm exam mark of 70.3% and scored a mean final exam mark of 71.5%, for a change of +1.2 percentage points. Students who did not view the videos started with a mean midterm exam mark of 73.1%, and scored a mean final exam mark of 70.5%, for a change of -2.6 percentage points. The difference between these two mean changes was not statistically significant ($p>0.05$).

In terms of qualitative feedback, only two respondents were critical of the videos. One stated that the videos were "a bit slow paced. I watched them all at x2 speed." The other commented that the videos were "sometimes not as in depth as course material".

Positive comments were universally concerned with the content and clarity of the videos. For example: "These videos were very helpful to my better understanding of the basics. Would have liked to have videos for everything we covered in class"; and "The videos were wonderful. I think it could have been helpful to have a calculation example up there (written in long description)."

Two respondents indicated that the video package is worth between $500 and $1000 (Canadian dollars), while the rest felt the value to be less than $500. Video and audio quality, lecturer word choices, and instructor expertise were all rated universally as excellent.

Discussion

While our comparative results are statistically null, there is at least a perceived increase in performance among students who adopted the online tools to augment lecture-based learning. There is additionally a consistent report from students that the videos were useful and pleasant. While the videos were developed ostensibly for preparing medical students worldwide for the epidemiology component of the USMLE licensing examinations, solely as an online-only course, there is clearly some utility in using them to reinforce undergraduate classroom teaching, as well.

As our sample was comprised of non-clinicians, their background knowledge of clinical issues was minimal, and their baseline knowledge of epidemiology was nil. With individuals preparing for USMLE testing, i.e. the traditional international market for the Lecturio videos, there is an assumption that students had, at the very least, been exposed to peer-reviewed studies using epidemiological methods. So, while an online-only approach is viable for physicians with such minimal backgrounds, it seems unlikely that these videos would be sufficient independent training for non-clinical undergraduates. For the latter, the videos are best used as an augmentation to a traditional, lecture-based course.

The utility of video augmentation might be more noticeable on overall student cognition, rather than specifically on scholastic performance. Previous research [3] has emphasized that technology-based learning environments have an influence on students' higher order thinking. Engagement with a student's deep learning might influence not only higher-order thinking, but also recall and information synthesis, both ultimately useful for application to professional practice [3].

It has been argued, though, that undergraduate epidemiology education should favor a conceptual rather than technical approach, [4] meaning that mastery of equations and mathematics should be severely deprioritized in favour of understanding of grander public health concepts. Thus, a focus on historical case studies and contexts should be focused upon [5].

Our findings, that students found the Lecturio content to be not as "in depth" as traditional lectures, and that it was "slower paced" suggests that the Lecturio content may not be an effective deep learning education tool, at least for a subset of students. For that subpopulation, the augmentative content allows them to "better understand the basics," as one student described it.

Student preference appears to be shifting toward increasing embracing of technologies and untraditional teaching modalities, with recent research demonstrating that students tend to show preference for courses with online delivery compared to in-person format. Studies suggest that an online format allows for increased in professor-student communication, increased student motivation, easier access to course content, and instant feedback after completion of online assignments and exams [6]. This is especially relevant to the exploding medical student market in emerging economies in East and South Asia, [7] who comprise a strong component of the Lecturio market.

As the education industry is worth billions in the USA alone, [8] and likely trillions globally, universities and private enterprise will be increasingly partnering on providing semi-private online education opportunities. Due to resource and scheduling demands, and to improvements in telecommunications, the move to online and hybrid courses is unerringly accelerating [9].

As early as 2018, online modalities were being identified as useful for teaching epidemiology specifically, with special attention to the reproduction of the lecture experience via an online platform [10]. Researchers project that within this decade, up to 40% of epidemiology students will be studying exclusively online [11]. Moreover, researchers have found students who take online classes perform better than those who took the same course through traditional face-to-face instruction, but, critically, hybrid instruction is the most effective [11].

Similar to our non-significant findings, research conducted by Nowell suggested that hybrid/online learning does not surpass content delivered in person [12]. This is contrary to the assertions of Werler at al, who reported on a meta-analysis that found that students who take online classes perform better than those who took the same course through traditional face-to-face instruction, but that, critically, hybrid instruction is the most effective, in terms of measurable outcomes [11]. At the very least, it seems that hybrid and online course delivery is not inferior to traditional in-person education [12].

Conclusion

While differences in exam performance between groups receiving and not receiving augmented online learning were not statistically significant, there is a sense that such augmentation nevertheless contributes to student enjoyment and motivation, possibly by better allowing student self-pacing. As global demands for epidemiology training accelerate, the role of pre-recorded asynchronous courses will become evermore important. Future research into the specific topics within the science of epidemiology best attuned online instructions will help educators better calibrate multiple teaching modalities for optimal student engagement and performance.

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