Digital tools during online lectures and their effect on student engagement and learning

Pedagogiskt docenturarbete

Henrik Andersson
Introduction

The COVID-19 pandemic demanded an abrupt shift from classroom to online lectures. Many countries around the world shut down educational institutions and medical schools had to deliver the medical curriculum using remote strategies without enough time to prepare virtual educational environments\(^1,^2\). Face to face lectures were moved to online platforms such as Zoom or Microsoft Teams. Now that the pandemic restrictions are lifted, we can choose to go back to the classrooms, give lectures fully online or in a hybrid setting, with some students participating in person and some virtually. When giving lectures online, lecturers are often met by black squares with a written name and a mute symbol instead of looking out over a classroom full of students. It can be hard to read interpersonal cues and there is a risk that students do not actively participate in the lectures\(^2\). Students and teachers may experience Zoom fatigue and lack valuable opportunities for casual social interaction\(^3\). Advantages of online lectures are the possibility to invite remote guest speakers who do not need to travel to campus and technology allows for unique modes of student interaction and discussion. How engaged are students in online lectures? Are they simply listening and taking notes, or are they actively participating in discussions, asking questions? A study by Paul and Jefferson found no difference in student performance between face to face and online teaching regardless of gender and class rank\(^4\).

Digital tools can support a wide range of objectives in online teaching, such as enhancing student engagement, interaction and feedback. But can it increase students’ comprehension and retention of the lecture content, promote engagement and will it improve their results? Are there any challenges and limitations associated with these tools, such as technical issues and accessibility barriers or integrity concerns?

Digital tools

There are different types of tools that can be used to encourage student participation and engagement during online lectures and at the same time provide teachers with real-time data on student understanding of the lecture concepts. Students can use smartphones or computers to provide their answers and reports of the results can be generated and presented by the lecturer.
Some tools create online polls and questions and provide feedback in real time. Examples of such tools are Mentimeter\(^5\), Poll-maker\(^6\), SurveyMonkey\(^7\) and the poll function built into Zoom\(^8\).

Other popular tools are Game-based platforms. They can help you create quizzes and surveys. Digital games may be played in teams or allow student to compete against each other and can provide opportunities for students to interact with academic content through decision-making, problem solving and reward mechanisms. Kahoot\(^9\) is an online quiz platform that allows students to compete against each other in real time. Quizlet\(^10\) is a flashcard platform that can be used to create and share digital flashcards as well as tests, quizzes, and study games that are accessible online and via a mobile device.

Other tools can be used to brainstorm, mind map, and collaborate during lectures. AnswerGarden\(^11\) is an online collaborative tool that can be used to gather feedback, brainstorm, or conduct surveys. Students can ask questions, create a live word cloud, and let other students contribute their thoughts or answers. It can then generate visual representations of the responses. Google Jamboard\(^12\) and RealTimeBoard\(^13\) are digital whiteboards that allows students to collaborate and share ideas with the whole class in real time. Padlet\(^14\) is a digital sticky note board that allows students to post thoughts, ideas, and questions. Google Drive\(^15\) can be used to create documents and collaborate on in real time. Formative\(^16\) is an online response system that provides lecturers the opportunity to assign activities to students, receive the results in real time, and then provide immediate feedback to students.

All these tools can be used to make online lectures more interactive for students and strengthen teacher-to-student or student-to-student communications.

**Student views**

A study by Hahn et al\(^17\) concluded that recorded lectures, using static cameras, and “excessively long” recorded lectures received negative responses. Students value live lectures, citing reasons such as a sense of community and immediacy in feedback\(^18\). On the other hand, students also appreciate the efficiency and flexibility of recorded lectures\(^18\).

Overall, students and teachers have positive attitudes towards technology integration and feel that is has positive impacts on learner satisfaction, promotes engagement and facilitates academic success\(^19\). Beckman\(^20\) reports that students are positive towards integrated functions featured in video conference platforms. The chat function was expressly praised for enabling a spontaneous, uninterrupted exchange. The students believed that the group room function should be deployed in every online lecture. They also rated the exchange with other students in small groups and the
subsequent presentations as beneficial for the communication and discussion. Surveys via a voting app were also considered highly engaging.

**Do they improve results?**

There are several studies showing positive effects of using digital tools in teaching. Digital games may have a positive influence on cognitive engagement, make students achieve a greater understanding of course content and improve thinking skills\textsuperscript{21-24}. Incorporating gamified elements into courses, such as giving students digital rewards (points, trophies) where students can see how they rank against other students positively affects student motivation to complete learning tasks\textsuperscript{25-28}. Students who participated in gamified elements were more motivated to complete difficult learning activities, lead to greater participation in educational activities and showed persistence in exceeding learning requirements\textsuperscript{27, 29}. Digital games positively affect student attitudes about learning; student reports that games are fun, interesting, and enjoyable\textsuperscript{21-22, 27, 30-32}, which may account for increased student motivation. Nuci et al\textsuperscript{33} looked at the effects of using game-based digital quiz tools in online classes. They found a significant increase in students’ engagement and interaction. Further, the learning curve was steeper when using in-lecture quizzes (73\% vs. 57.5\%).

Rettig et al\textsuperscript{34} found that communication with lecturers, feedback from lecturers, and above all interaction between the students themselves to be key to the successful use of digital media.

A game-based digital quiz can improve students’ engagement and learning outcomes in online lectures by providing immediate feedback, enhancing interactivity and fostering a sense of competition and collaboration among students\textsuperscript{35}. Students who used game-based digital quiz performed better on post-tests than those who did not. In-lecture quiz results may also be used as input for re-planning the rest of the lecture, allowing the lecturer to focus on those questions where the students showed a higher miss-rate.

**Drawbacks?**

There are some potential drawbacks to using digital tools in online lectures. One potential drawback is that they can be distracting for students if they’re not used correctly. For example, if students are constantly checking their phones or laptops during a lecture, they may not be paying attention to the material. Another potential drawback is that they can be time-consuming for instructors to set up and
use. This can be especially true for tools like Jamboard and Padlet, which require the instructor to create the boards and add content.

Other challenges of using digital tools for online teaching include ensuring quality assurance, addressing equity issues, providing adequate support and training for teachers and students, and evaluating the effectiveness of the tools\textsuperscript{21}. Differences in computer literacy and access to digital devices and high-speed internet connections may not be as big a challenge in developed countries like Sweden as in emerging countries\textsuperscript{36}.

O’Doherty et al\textsuperscript{37} conducted an integrative review to identify barriers and solutions to online learning in medical education. Key barriers identified were time constraints, poor technical skills, inadequate infrastructure, and absence of institutional strategies and support. Their suggested solutions were improved educator skills, incentives and reward for the time involved with development and delivery of online content and improved institutional strategies and support.

**Implementation**

In my future online lectures I intend to implement more digital tools. I will encourage students to use the chat function for spontaneous exchange with me and each other. I believe game-based tools are particularly good at increasing student engagement, interaction and learning. I am especially intrigued by the idea of using in-lecture quizzes for re-planning the rest of the lecture, allowing me to focus on areas where the students had more difficulties.

Medical students as well as clinicians today are required to keep up to date with the latest technologies and remain flexible in the changing healthcare environment and to remain digitally literate. Teachers therefore have a crucial role in guiding and supporting the effective use of technology for learning. Increased use of digital tools during lectures may be one way to prepare medical students for the challenges they are faced with in this digital age.

Although the focus of this reflection was on online lectures, many of the digital tools may also be implemented during face-to-face lectures since most students bring a smartphone or computer into the classroom.
Conclusions

The conclusions of this reflection are that digital tools can be a valuable asset in online lectures and that the benefits outweigh the potential drawbacks despite the time commitment and training that is often required to successfully implement them. Digital tools are generally associated with enriching benefits, contribute to greater responsiveness, and can inspire a higher overall level of student engagement.

University lecturers should know their options and be able to critically assess if a digital tool will actually deliver added value – and if so, when. Digital tools in university teaching can only deliver added value for study purposes and promote effective learning if they are used and accepted accordingly by the students themselves. Therefore, it is important to consider the benefits and drawbacks of different digital tools for online lectures and how they can be integrated with pedagogical strategies and assessment methods to enhance students' results. Students describe benefits to face-to-face sessions and e-learning resources alike, pointing to the advantages of a suitable mixed approach featuring digital and non-digital teaching elements.

Key elements going forward are institutional strategies for implementing digital tools and professional development with special focus on digital literacy skills and awareness among the teacher community about the merits of online platforms.

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