



## Providing Students With Flexible and Adaptive Learning Opportunities Using Lecture Recordings

Larian M Nkomo, University of Otago  
Ben Kei Daniel, University of Otago

### Abstract

Lecture recordings can provide adaptable, highly flexible, and convenient access to learning materials. Higher education institutions employ lecture recordings to engage and enrich students' learning experience. However, educators have increasingly raised concerns that the availability of lecture recordings is likely to contribute to a decline in students attending lectures, and to poor learning outcomes. This study explored how students engage with lecture recordings and the extent to which access to these resources contributes to their learning. We administered self-reported measures (questionnaire) to undergraduate and postgraduate students (n=660) who had access to lecture recordings. The questionnaire items included both closed-ended and open-ended questions. The quantitative data was summarised using descriptive statistics. We then applied a sentiment analysis technique to triangulate and contest the results derived from the quantitative analysis. Overall, the results indicate that lecture recordings can provide students with flexibility and convenient access to learning materials, and ultimately enhance students' learning experience. Most respondents regarded lecture recordings as supplementary learning resources, not a replacement for lectures. They stated that the availability of lecture recordings did not influence their decisions to attend lectures. Further, some respondents reported that they used lecture recordings to prepare for exams, to revise, and to compare with the notes they took in class. This study adds to the growing need to examine institutional digital technologies that support flexible access to learning.

**Keywords:** lecture recordings; higher education; flexible learning

### Introduction

The 21st-century student is subject to many competing demands. They could be working one or two part-time jobs, studying, and taking care of a family. Therefore, it is essential to provide students with flexible access to learning so they can balance work and study (Hall & Ivaldi, 2017; O'Callaghan et al., 2017; Traphagan et al., 2010). Lecture recording is a digital learning technology that captures, records, and archives lecture content. These technologies comprise hardware and software components with built-in audio and visual capabilities. Over the last decade, their deployment in higher education has increased because they offer students flexible learning opportunities. Because these technologies capture live lectures, students can re-watch them and manage their learning under a variety of circumstances (Hall & Ivaldi, 2017).

Several studies suggest that students advocate the use of lecture recordings in their programmes of learning (see Joseph-Richard et al., 2018; O'Callaghan et al., 2017; Rahman et al., 2018). However, several educators continue to contest the value of providing lecture recordings to students, especially the value of making resources available before planned lectures so they can

engage with content before coming to lectures. They are concerned that, when students use lecture recordings, they are likely to stay away from live lectures. Some argue that using lecture recordings has a significant effect on the nature and quality of student engagement and interaction with lecturers. Further, some university teachers said that if they are being recorded, they might not feel free to use anecdotes and humour in their teaching. Some also fear that provision and distribution of lecture recordings could breach intellectual property rights because, once learning materials are in digital form, they can be easily shared across digital platforms (Dona et al., 2017; O'Callaghan et al., 2017; Witthaus & Robinson, 2015). Perhaps the most persistent concern of many academics is that students are likely to substitute lecture attendance with these recordings (Marchand et al., 2014; Toppin, 2011). However, recent studies have contested these views on the grounds that attending lectures does not necessarily lead to better learning outcomes (Eisen et al., 2015; Kauffman et al., 2018). Others have pointed out that the relationship between lecture recordings and attainment is ambiguous (Hall & Ivaldi, 2017; MacKay, 2019). Moreover, educators' concerns about lecture recordings affecting lecture attendance is a contested phenomenon—falling lecture attendance has little association with lecture recordings because the educational research on lecture attendance predates the introduction of these technologies in higher education (Daniel, 2017). For example, MacKay (2019) indicated that, although lecture recordings are considered to be a disruptive technology (with the potential to influence class attendance), there is insufficient evidence to conclude that using lecture recordings affects student attendance or attainment.

Studies have also indicated that the availability of lecture recordings does not necessarily lead to student absenteeism in physical lectures (see Aldamen et al., 2015; Price & Almpanis, 2015; Seifert, 2019). It should also be noted that students' willingness to attend physical lectures could depend partly on a lecturer's pedagogical approach, the nature of the subject, and its importance to a programme of study. Nevertheless, a course's delivery and pedagogical design can significantly determine the value of lecture recording to student learning (O'Callaghan et al., 2017; Toppin, 2011).

Using lecture recordings can positively influence physical lecture attendance. When lecture recordings supplement the physical lectures, there is an indication of a positive correlation between physical class attendance and viewing recorded videos (Aldamen et al., 2015). Further, Seifert (2019) indicated that the availability of lecture recordings caters for a variety of learning needs, which would have little effect on lecture attendance.

## **Related literature**

Research has consistently reported that students consider lecture recordings to be resources for supplementing physical lectures rather than replacing them (Cooke et al., 2012; Copley, 2007; Leadbeater et al., 2013; Marchand et al., 2014; Nordmann & McGeorge, 2018; Soong et al., 2006; Traphagan et al., 2010). Lecture recording can help struggling students to view and listen until they are comfortable with the topic. Recordings are also readily available to students who cannot attend classes or are new to higher education. They can replay lectures at any time, in any place, as often as needed (Joseph-Richard et al., 2018).

Students use lecture recordings for a range of purposes including preparation for exams, clarification of complex topics, flexible access to learning, taking better notes, making up for missed lectures, and help in balancing their schedules between their studies and other obligations (Chapin, 2018; Daniel, 2017; Dona et al., 2017). In some instances, students can take advantage of lecture recordings to prepare for lectures that adopt a flipped-classroom approach (Witthaus & Robinson, 2015).

Studies also indicate differences in attitudes, and the way lecture recordings are used in subject domains. For example, lecturers in fields such as social sciences, business, and engineering show a more positive attitude to lecture recordings than those in the sciences (Dona et al., 2017; Rahman et al., 2018). Students' perspectives on lecture recordings also vary. Chapin (2018) identified four scenarios in which students use lecture recording: those who did not access lecture recordings but attended lectures regularly; those who used lecture recordings as a supplement for studying and attended lectures regularly; those who attended classes and used the recordings for studying and catching up on missed lectures; and those who did not attend lectures (deliberately or through circumstance) and relied solely on the recordings.

Edwards and Clinton (2019) examined student engagement with lecture recordings and its effect on learning outcomes. The study found a significant drop in attendance after lecture recordings were made available. The study further indicated that students used lecture recordings differently, and that students who engaged in deep learning usually used lecture recordings as supplementary learning material. In contrast, those who were less engaged tended to embrace a surface learning approach. Further, students who engaged in surface learning were less likely to use lecture capture as a supplementary tool. Trenholm et al. (2019) explained that an increase in surface learning is due to a combination of two aspects: a decline in lecture attendance, and reliance on recorded lecture videos. Trenholm et al. (2019) further observed a negative relationship between students' use of lecture recording and academic performance in mathematics. However, there was no evidence to suggest that using recorded lectures alone can contribute to poor mathematics outcomes. Students who used lecture recordings regularly might already have limited mathematical abilities. Variation in the use of lecture recordings can be attributed to the nature of the subject, and the time involved in facilitating the subject. Danielson et al. (2014) reported that students are more likely to view recorded lectures in courses that are delivered in a short period, are heavily lecture driven, and contain information that is not available in other formats.

It is possible that, in some cases, students are likely to substitute live lectures with recorded lectures, but we believe making lecture recordings available to students can outweigh the negative consequences because these resources can provide contemporary students with flexible access to learning materials. For instance, Furini et al. (2019) explored the lecture-recording system, "ONELab", which streams video lectures to 1251 students. The system was designed to improve the student learning experience by offering flexible access to learning materials. The results suggested that students who used the system reported that they had an enriched learning experience and better learning outcomes. In particular, those who reported an enhanced learning experience noted that the flexibility in accessing the learning materials was highly adaptable and compatible with their lifestyle. O'Callaghan et al. (2017) similarly said that when it comes to lecture recordings, the positives outweigh the negatives, and they should therefore be widely used in higher education.

Drawing on this line of research, our research advocates student-centred learning and encourages the provision of a flexible learning environment. We strongly believe that having access to lecture recordings is fundamental because it provides students with an extra resource for their learning. Furthermore, attending physical lectures does not automatically translate to learning—some studies show no relationship between attendance and performance (Eisen et al., 2015; Kauffman et al., 2018). We also encourage a student-centred approach to learning because contemporary students in higher education are widely diverse and tend to have multiple responsibilities such as jobs, families, and school. For these students to succeed, it is critical that we design a highly flexible and personally adaptive learning environment. Lecture capture and associated digital technologies enable educators to capture live lectures and to record and distribute the transcripts to students at scale. More specifically, lecture-capture technologies such as Echo 360 allow live streaming of lectures, making them available to many students in real

time. Most lecture-capture technologies enable students to interact with each other and the lecturer. For instance, lecture-recording platforms allow students to add annotations, flag items as confusing, and ask questions. The research goal in this article was to examine how lecture recording contributes to a flexible and adaptive student learning experience.

## **Methods and procedures**

The study used a survey research design, involving the administration of an online questionnaire with closed- and open-ended questions.

The recruitment procedure involved profiling all university courses (n=132) that provide recorded lecture materials to students. A total of 660 students volunteered to participate in the survey and shared their experience about the value of engaging with lecture recording and its contribution to their learning. The study was undertaken in a public research-intensive university in New Zealand. The project was part of institutional research to provide better strategies to support learning and teaching with digital learning technologies.

Because student experience varied according to context and academic division, the study's analysis focused on self-reported experiences. The questionnaire included closed-ended questions measured on a five-point Likert scale. Some of the closed-ended questions were followed by open-ended questions to provide context for the responses to the closed-ended questions. Quantitative data was analysed with IBM SPSS 22, and descriptive statistics were used to summarise the results.

Responses to open-ended questions were compiled and analysed thematically with NVivo software. The analysis process involved reading and getting familiar with the data; and coding, developing, and interpreting the data (Braun & Clarke, 2006). The themes were identified within text segments associated with the responses to the closed-ended questions and coded for both prevalence and frequency of occurrence. The qualitative data was subjected to further analysis with a sentiment analysis approach—this is a natural language processing (NLP) technique that is commonly used to analyse textual data and automate the extraction or classification of sentiment (Hussein, 2018).

Sentiment analysis is also used to examine semantic relationships and meaning in people's experiences. Some algorithms used in sentiment analysis are based on Naïve Bayes (NB), Max Entropy (MaxEnt) and Support Vector Machines (SVM) (Altrabsheh et al., 2013; Xie et al., 2019), among others. Furthermore, sentiment analysis involves identifying and extracting relevant information about individuals' subjective feelings and experience of a phenomenon. With the increased use of services such as Twitter and online feedback forums, there is more interest in identifying the sentiment of the text generated on these platforms (Kiritchenko et al., 2014; Veletsianos et al., 2018).

Because sentiment analysis can help us to understand people's feelings about a particular entity, it is usually used to identify individuals' feelings towards products, movies, and politics, among others. Although not widely used in education, sentiment analysis has been used in massive open online courses (MOOCs) to identify students' opinions about elements such as peer assessment, and sentiments that scholars may face online (see Veletsianos et al., 2018; Wen et al., 2014).

It is widely acknowledged that educational research often uses self-reported measures to generate a range of rich qualitative and quantitative data. For qualitative data, data analysis is usually grouped in themes using subject experience or the researcher's understanding of qualitative research inquiry. However, because this process can be challenging and depends on the researcher's experience, the outcome can reflect the extent of the researcher's knowledge.

Because sentiment analysis uses automated techniques and algorithms, it can reduce the daunting tasks of coding data line by line and identifying themes. Sentiment analysis can be used to corroborate or contest findings from other forms of data analysis, and it can provide rich insights by identifying students' opinions over time—enabling educators to reflect on their teaching and make necessary changes (Altrabsheh et al., 2013).

## Findings and discussion

The study reported in this article explored how students engaged with lecture recordings and the extent to which access to these resources contributed to a flexible and adaptive learning experience. The article presents a synthesis and summary of the critical findings rather than detailed results. Overall, the findings indicate that lecture recording enhanced the student learning experience and provided students with flexible learning opportunities and ways to engage with content, lectures, lecturers, and peers. Most of the students in the study said that lecture recordings improved the way they learn because of the flexibility and adaptability of access to learning. These students arguably have more non-school-related responsibilities, and the deployment of a variety of digital learning technologies can provide them with flexible access to learning, enabling them to achieve the balance they need to succeed (Hall & Ivaldi, 2017; O'Callaghan et al., 2017; Traphagan et al., 2010). This flexibility allows students to meet 21st century demands, which can require simultaneous work and study. Moreover, during times such as the COVID-19 pandemic, lecture recordings enable students to adapt their learning to the changing environment. They can continue to learn, regardless of moratoriums on traditional physical learning in lecture halls.

Students also said that lecture recordings helped to foster self-directed learning. These findings are congruent with previous research that reported that lecture recordings provide flexible and equitable access to learning materials—especially for those who are ill (Chang, 2007), and for those with work and family commitments (Hall & Ivaldi, 2017; Taplin et al., 2014). Data in the present study revealed that lecture recordings provided students with the ability to juggle multiple demands, and supported flexible access for students with medical conditions or learning disabilities. These particular findings substantiate a recent study which reported that dyslexic students find access to lecture recordings not only useful for their learning, but an effective way to learn (Nightingale et al., 2019).

Students in our survey also said that they found lecture recordings useful when they were revising for exams. During the semester, they used lecture recordings as supplementary learning material rather than replacements for attending lectures. Furthermore, lecture recordings helped students who struggled with the language of instruction. Those students could rewind and replay recordings as often as necessary to understand the content—a feature unavailable in live lectures. Students tend to adapt and engage flexibly with lecture recordings based on need and individual circumstance. Although the provision of lecture recordings might influence attendance, students also tend to wander off during conventional lectures (Wammes et al., 2019) and occasionally miss a lecture due to circumstances beyond their control. Students also tend to be anxious if they feel they cannot meet academic or non-academic tasks (AlKandari, 2020). The availability of lecture recordings assures them that they will be able to catch up on their schoolwork, and can help to reduce student anxiety.

Several respondents reported that recorded lectures improved their engagement with the course content. They also said that the recorded lectures' availability allowed them to be more focused during lectures instead of multitasking (taking notes and concentrating on clarifying concepts) during the lecture. They indicated that, because they knew they would have access to the recordings later, they could concentrate on listening to the lecturer.

Research suggests that students do not necessarily exhibit the same usage patterns of lecture recordings (O’Callaghan et al., 2017; Witthaus & Robinson, 2015). Our analysis showed varied engagement. Moreover, students who reported missing lectures, and those who could not take notes effectively during lectures, view the provision of lecture recordings as a safety net. We observed that, when used as supplementary learning materials, lecture recordings can support self-directed learning. However, wide-scale deployment of these resources will require academic programmes to be restructured and pedagogical practices to be transformed. All of this can require additional resources and professional upskilling of educators in relevant pedagogical approaches, especially as lecture recordings are not viable for all programmes.

## **Conclusion**

We think lecture recordings are a valuable learning resource for students. Lecture recordings provide more adaptable, flexible, and convenient access to learning materials. Higher education employs lecture recordings to engage and enrich students’ learning experience. Educators have increasingly raised concerns that the availability of lecture recordings is likely to contribute to a decline in students attending lectures and poor learning outcomes, but when used strategically they can be a powerful learning and teaching tool. When used as an extra learning resource, lecture recordings provide more avenues for students to learn and enhance their learning experience. Furthermore, studies have indicated that releasing digital learning material before lectures can improve students’ active engagement in lectures (Daniel & Bird, 2019). For over a decade, studies have shown that many higher education students are overwhelmingly advocating for lecturers to record their lectures and make them available.

Educators have raised concerns that the wide-scale provision of lecture recordings to students is likely to have a detrimental effect on learning, and that some students may choose to use these materials as a substitute for attending lectures. However, studies have also revealed that recordings offer students increased flexibility to access learning anywhere and anytime, and have less influence on students’ choices to attend lectures (Topale, 2016).

The availability of lecture recordings assures students that they can catch up on their schoolwork if they miss lectures for any reason. Availability of these resources can help reduce student anxiety. Therefore, the focus of the discourse about lecture recording and its use in higher education should shift to learning strategies that promote the strategic use of these materials, rather than resisting its deployment. It is also essential to systematically address the concerns educators raised about problems associated with recording lectures and making them available on the internet.

## **Limitations**

Although students in several institutions of higher education have consistently and increasingly advocated for the provision of lecture recordings to support their learning, caution is needed because the broader institutional implementation of lecture recordings requires a deeper understanding of the issues university teachers have raised about the unintended consequences of deploying these resources. Institutional deployment will also need the provision of academic development programmes to academics to enable them to embrace and implement pedagogies that support teaching and learning with lecture recordings. A more comprehensive implementation also requires the digital platforms and associated technologies (e.g., installation of hardware and software in lecture theatres).

Providing lecture recordings to students before planned lectures helps to transform student engagement in class; for example, by using a flipped learning approach. Therefore, students need to embrace new forms of learning. The present study has reported a summary of the findings and,

by and large, it advocates for students' learning preferences. The study results presented in this article examined only students' preferences and perspectives on the value of accessing lecture recordings. It did not investigate differences in the outcomes before or after lectures. Future studies should implement experiments that demonstrate the difference lecture recordings make to a learning experience and learning outcomes. More studies are also required to look at the issues raised by university teachers—relating to the production, distribution, and use of lecture recordings.

Studies must be carried out to look at the institutional policies, principles, frameworks, and guidelines that are needed to ensure that issues of privacy, breach of intellectual property rights, and informed consent in recording and use of lecture recordings are achieved. Using a range of data collection methods can provide further insight, because online surveys could favour those who are more comfortable in online environments. Therefore, in future work, we will use different data sets (such as trace data and other self-reported data) to gain a better understanding of student experience.

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## Biographical notes

### Larian Nkomo

[larian.nkomo@otago.ac.nz](mailto:larian.nkomo@otago.ac.nz)

Larian is currently studying towards his PhD in Higher Education at the University of Otago, where he is also a research assistant. His research interests lie in higher education, student engagement, learning analytics, educational data mining, flexible learning, and educational technology.

### Ben Kei Daniel

[ben.daniel@otago.ac.nz](mailto:ben.daniel@otago.ac.nz)

Ben Kei Daniel is Associate Professor in Higher Education, and the Head of Department of Higher Education Development Centre at the University of Otago, New Zealand. He obtained his PhD jointly in Educational Technology and Artificial Intelligence in Education (AIED) from the University of Saskatchewan in Canada. His current research focuses on big data and analytics in higher education.

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