Students’ behavioural engagement with recorded lecture videos: Panopto video analytics

Seyum Getenet
University of Southern Queensland
Australia
Seyum.Getenet@usq.edu.au
Niharika Singh
University of Southern Queensland
Australia
Niharika.Singh@usq.edu.au
Eseta Tualeulelei
University of Southern Queensland
Australia
Eseta.Tualeulelei@usq.edu.au
Yosheen Pillay
University of Southern Queensland
Australia
Yosheen.Pillay@usq.edu.au
Sue Worsley
University of Southern Queensland
Australia
Sue.Worsley@usq.edu.au

Abstract: This study reports part of a larger study that explores three technologies – Padlet, Panopto videos and Google Docs and their effectiveness in enhancing university students’ engagement in online learning. The current paper analysis university students’ behavioural engagement with recorded lecture videos uploaded in Panopto. Panopto video analytics was used as a source of data. Descriptive statistics were used to analyse the data, including percentage and frequency. The analyses focused on 58 university students viewing behaviour in relation to video dropout, average viewing time, completion rate and frequency of viewing enrolled in a mathematics course. The result showed that students tended to drop out of watching recorded lecture videos at the beginning of the first 35% of the video duration, which is an approximate average viewing time of 14 minutes of 40 minutes of online lecture video. In addition, students prefer to view the lecture videos with multiple pauses, at least an average of 3 times, with a completion rate greater than 95%. These results have implications for improving the aspect of students’ learning from online lecture videos.

Keywords: Behavioural engagement, lecture videos, Panopto analytics, university students

Introduction:
Recorded lecture videos are increasingly used and have become an essential part of higher education globally to add flexibility and allow students to view lecture material multiple times and from varied locations (Edwards & Clinton, 2019). In this study, recorded lecture videos are defined as videos that provide audio and video (can view lecture slides) presentations. The recordings are subsequently made available to students online. While students enjoy flexibility in learning through recorded lecture videos, making students engage in these videos is often challenging (e.g., Costley et al., 2017). Engagement is a widely used term, but it appears to have a range of meanings and interpretations, particularly in higher education (Dixson, 2015; Lawson & Lawson, 2013; Taylor & Parsons, 2011). For example, the Macquarie University Learning and Teaching Centre [MULTC] (2009) defined engagement as “the extent or quality with which students are committed and actively involved in their learning” (p. 1). These definitions emphasised individuals’ engagement with learning, which is a key influencer of engagement. Coates (2006) explained engagement with students’ social interaction with teachers and their peers. These multiple conceptualisations of engagement have resulted in diverse views about engagement and the interconnectedness of cognitive, socio-cultural, affective, behavioural, ecological, and organisational factors.
(Kahn et al., 2017; Lawson & Lawson, 2013). Redmond et al. (2018) defined and proposed an online engagement framework for higher education with five dimensions (social, cognitive, behavioural, collaborative, and emotional). Each dimension comprises several specific indicators that represent online student engagement. Klefodimos and Evangelidis (2014) suggested useful metrics that evaluate learner engagement in relation to students’ lecture video viewing behaviours, such as when and where video viewings and performance for the course and viewing patterns.

In this study, however, the author focused on students’ engagement in recorded lecture videos which can contribute to their behavioural engagement. The analysis shared in this study was conducted to investigate how students in higher education engaged with recorded video lectures available online. The study further examines learners’ lecture video viewing patterns by completion rate, viewing duration, time of view, viewing dropout and frequency of viewing as a measure of their behavioural engagement. We focused on the information acquired from Panopto analytics. As a result, the study answers the following research questions.

[1] How are students recorded lecture videos viewing engagements described?

[2] What are the implications of university students recorded video lecture engagement for improved learning?

This study has important implications for future pedagogical development and adds to the sense of urgency regarding research into best practices using video recording lectures to enhance student engagement.

**Literature review**

Recorded lecture videos are made available and used increasingly in higher education teaching to add flexibility and allow students to view lecture material multiple times and from varied locations (Edwards & Clinton, 2019; O’Callaghan et al., 2017). They are a powerful medium in higher education to promote engagement and effective learning outcomes (Yousef et al., 2014). Some researchers report that students find recorded lecture videos attractive and helpful in increasing their engagement in learning a new topic by providing autonomy (Albó et al., 2015; Yousef, Chatti, & Schroeder, 2014).

Oh and Kim (2016) argued that learners’ behavioural engagement in an online environment is discernible from student participation in online provided lecture videos. As a result, educators in higher education have found that recorded lecture videos continue to prevail as the predominant strategy in most higher education courses worldwide to add flexibility resulting in increased student engagement. Studies measured students’ social, behavioural, collaborative, emotional and cognitive engagement (e.g., Bowen, 2005; Redmond et al., 2018). This study focused on behavioural engagement, which emphasised students’ engagement with their learning as behavioural engagement is the most fundamental form of engagement.

**Behavioural engagement**

Behavioural engagement is the active learning process, and it is a fundamental form of engagement that promotes what students do and think to promote learning (Redmond et al., 2018). This definition echoed the definition provided by MULTC (2009). MULTC defined engagement as “the extent or quality with which students are committed and actively involved in their learning”. Similarly, Bowen (2005) stated that students’ behavioural engagement is the most fundamental form of engagement. Redmond et al. (2019) considered behavioural engagement as an important element of engagement to enhance students’ interest in learning and develop their academic skills, which contribute to successful learning outcomes. An earlier study by Fredricks, Blumenfeld, and Paris (2004) supported this argument, who described behavioural engagement as “doing the work and following the rules” (p. 65).

However, measuring any form of student engagement is becoming challenging. A few frameworks have been used recently to measure student engagement. For example, Bote-Lorenzo & Gomez-Sanchez (2017) identified 16 indicators to measure student engagement in an online course, such as the percentage of lecture videos totally or partially watched, the percentage of finger exercises answered, and the percentage of assignments submitted. Similarly, Li & Tsai (2017) analysed 14 indicators related to time spent on educational resources and found that students’ engagement with course videos varied and clustered into patterns. Singh et al. (2018) proposed a content engagement score to measure student engagement towards specific content. The number of views or clicks (Koller et al., 2013), length/duration of viewing time (Guo et al., 2014, Kim et al., 2014), and completion rate and frequency of viewing (Breslow et al., 2013, Jordan, 2014) can be used as one of the measures and indicators of students’ behavioural engagement. These engagement indicators are described in the following section.
Completion rate
Research shows that many students who start watching the videos do not complete all the video lectures (Gorissen et al., 2012; Guo et al., 2014). While students enjoy flexibility and quality in learning through recorded lecture videos, several studies showed that the number of watching videos to completion is lower (e.g., Costley et al., 2017). This could be due to different factors such as the length of the video, lack of motivation, many videos to watch and distractions while watching. Designing video lectures that are a specific length has been shown to increase students’ chances of completing the lecture videos (Guo et al., 2014). In addition, getting students to use the video platform effectively may influence their decision to continue watching the video lectures (Kim et al., 2014).

Generally, although the number of students enrolled in online courses that use video lectures is on the rise, the number of students watching video lectures is low, and the number watching videos to completion is even lower.

Viewing duration
Several studies show that a digital item’s quality is linked to the audience’s decision to continue watching or listening after first opening it (Krumme et al., 2012; Wu et al., 2018). Therefore, the average amount of time the audience spends watching a video influences students’ engagement in the videos (Wu et al., 2018). Earlier studies showed that a student’s attention declines after the first 10 minutes of class, and although it may return at the end of a class, students remember only about 20% of the material presented (e.g., Hartley & Cameron, 1967; MacManaway, 1970).

Time of view
When a significant number of students interact with a common video portion, the resultant data can be binned to highlight peaks in the video timeline (Kim et al., 2014). Geri et al. (2014) describe the “U-shape” nature of video consumption throughout a program. This means that more videos are watched at the beginning and end of a program than in the middle and that the number watched at the end of a program was found to be the peak across all the programs they analysed. The high viewership at the end of the program was attributed to the students demonstrating their awareness of the forthcoming assessment. Accordingly, clearly establishing time parameters may encourage students to watch videos completely because they are aware of assessment deadlines.

Viewing dropout and frequency of viewing
Dropout rate is defined by the percentage of students who start watching a video but leave before playing entirely. The length of time learners spends watching lectures, and their causes have been the late source of some debate. Guo et al. (2014) investigated on data from 6.9 million videos by analysing the length of time learners spent on a video. They produced a much reproduced finding that the median engagement is 6 minutes. They also found that learners rarely watched more than half of the videos that were nine minutes in length. Finally, establishing time parameters may be effective in getting students to complete the video lectures as they anticipate assessment (Geri et al., 2014).

The study
This study reports part of a larger study that explores three technologies – Padlet, Panopto videos and Google Docs and their effectiveness in enhancing university students’ engagement in online learning. In this current study, we studied University students’ behavioural engagement on recorded lecture videos using Panopto analytic data. The study involved 58 students enrolled in a mathematics course from a regional University in Australia. Data came from ten videos of recorded lecture videos taught from February – June 2022. The videos were recorded and made available through the Panopto video platform from the start of the course. Panopto is a tool integrated into Canvas that makes working with video easy. It can record lectures or presentations, upload an existing video, or embed videos with content. It also provided minute-by-minute analytics for each video.

Participants, data source and analysis
The number enrolled in the course were 58 students. Ten lecture videos of various lengths were uploaded at different times during the 13 week semester. The lecture video recording ranges from 16.9 minutes to 108.9 minutes, as shown in Table 1.

<table>
<thead>
<tr>
<th>Lecture video</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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</tbody>
</table>
In this study, university students’ lecture video watching patterns were analysed to understand and provide a unique opportunity for students to engage with recorded lecture videos. Video analytics and reporting from Panopto were the sources of our data. The Panopto analytics provides detailed reports on audience engagement and comprehensive insights into viewing behaviour for every video on the Panopto portal.

Results and discussion

This study analysed university students’ behavioural engagement with recorded lecture videos in relation to their viewing completion rate, viewing duration, time of view, viewing dropout and frequency of viewing. The research questions guiding the study were: [1] How are students recorded lecture videos viewing engagements described? [2] What are the implications of university students recorded video lecture engagement for improved learning? The results and discussions are presented in line with the research questions.

Students recorded lecture videos viewing behaviour

The completion rate is the first indicator to show students’ behavioural video engagement. The results showed that students completed videos of various percentages. The results are shown in Table 2.

<table>
<thead>
<tr>
<th>Video</th>
<th>Percent of videos completed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 50</td>
</tr>
<tr>
<td>Lecture 1</td>
<td>21</td>
</tr>
<tr>
<td>Lecture 2</td>
<td>20</td>
</tr>
<tr>
<td>Lecture 3</td>
<td>8</td>
</tr>
<tr>
<td>Lecture 4</td>
<td>11</td>
</tr>
<tr>
<td>Lecture 5</td>
<td>13</td>
</tr>
<tr>
<td>Lecture 6</td>
<td>6</td>
</tr>
<tr>
<td>Lecture 7</td>
<td>11</td>
</tr>
<tr>
<td>Lecture 8</td>
<td>7</td>
</tr>
<tr>
<td>Lecture 9</td>
<td>10</td>
</tr>
<tr>
<td>Lecture 10</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 2: Comparison of average minutes delivered with the percentage of completion (N = 58)

As shown in Table 2, most students’ completion rate is less than 50% in each video, regardless of the video length. This echoed the study by Gorissen et al. (2012) and Guo et al. (2014), indicating that many students who start watching the videos do not complete all the video lectures. However, it contradicts the study by Costley et al. (2017), who compared completion rate and video length. They claimed that the number of watching videos to completion is lower due to various factors, including the length of the video.

The second indicator that can describe students’ behavioural engagement is video viewing duration. The Panopto analytics presented in Figure 1 showed that dropping out before 50% of the video is higher than students watching more than half and completing the video.
Figure 1: Average video viewing duration

Taking into account the average minutes delivered in a five number summary, the minimum value is 4.9 minutes which comes from a 16.9 video duration, whereas the maximum of 27.3 minutes was from 59.7 minutes video duration. The median average minutes delivered was 10.3 minutes, with a mean of 11.7 minutes. The mean video viewing duration results (11.7 minutes) of this study are similar to earlier studies such as Hartley and Cameron (1967) and MacManaway (1970). These studies showed that students start to decline watching videos after the first 10 minutes.

The third indicator to describe students’ video engagement behaviour is the time of view. The results of the viewing time were compared with the course assessment due dates. Students were required to involve in four assessments, which should be submitted on various dates: Assessment 1 (due on 22 March), Assessment 2 (due on 3 May), Assessment 3 (due on 24 May) and the Final exam on 15 June. The number of viewers in relation to the assessment dates is shown in Figure 2.

Figure 2. Lecture video versus time (Date viewed or downloaded).

The results in Figure 2 show that students started watching the videos the same day it was available for viewing. The frequency of clicks is continuous for at least 3 to 4 weeks after upload. However, the total number of students watching the videos was high at the beginning and middle of the semester, which is different from previous studies. For example, Geri et al. (2014) claimed the “U-shape” nature of video consumption throughout a course. This means that more videos are watched at the beginning and end of a program than in the middle.
The last two behaviours students show in video engagement are frequency of viewing and viewing dropout. As shown in Table 3, students tended to watch the first few videos multiple times and declined afterwards.

<table>
<thead>
<tr>
<th>Video</th>
<th>Views and downloads</th>
<th>Minutes delivered</th>
<th>Average minutes delivered</th>
<th>Number of viewers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture 1</td>
<td>65</td>
<td>1245.7</td>
<td>19.2</td>
<td>27</td>
</tr>
<tr>
<td>Lecture 2</td>
<td>56</td>
<td>417.3</td>
<td>7.5</td>
<td>28</td>
</tr>
<tr>
<td>Lecture 3</td>
<td>52</td>
<td>1230.3</td>
<td>23.7</td>
<td>24</td>
</tr>
<tr>
<td>Lecture 4</td>
<td>45</td>
<td>526</td>
<td>11.7</td>
<td>20</td>
</tr>
<tr>
<td>Lecture 5</td>
<td>44</td>
<td>215.1</td>
<td>4.9</td>
<td>23</td>
</tr>
<tr>
<td>Lecture 6</td>
<td>42</td>
<td>479.8</td>
<td>11.4</td>
<td>14</td>
</tr>
<tr>
<td>Lecture 7</td>
<td>41</td>
<td>654</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Lecture 8</td>
<td>36</td>
<td>245.5</td>
<td>6.8</td>
<td>15</td>
</tr>
<tr>
<td>Lecture 9</td>
<td>35</td>
<td>321.2</td>
<td>9.2</td>
<td>20</td>
</tr>
<tr>
<td>Lecture 10</td>
<td>35</td>
<td>229.8</td>
<td>6.6</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 3. Students’ frequency of viewing lecture videos (N = 58)

As shown in Figure 3, even though students download and view many videos, they often dropout from watching the videos in a short time before completing 50%. This result is not surprising as similar findings were reported in various studies, such as Guo et al. (2014) and Geri et al. (2014).

![Figure 3: The percentage of recorded lecture videos, dropouts, and completion](image)

Implications for video lecture engagement and improved learning

Several factors have been driving the adoption of lecture recordings in universities. These include pedagogic reasons and students both desiring and increasingly expecting lecture recordings to be available, partly driven by the increasing hours students are engaged in external work. Moreover, universities are also aware of the need to be seen to make use of new technologies. However, successfully implementing lecture recordings requires an implementation strategy that encourages student engagement. This small study showed that considering the length of the video (such as avoiding long videos), was not a reason for students to dropout from watching. Saying that if the student did not finish half the video (<50) is considered a dropout gives us an average of 12 students. Furthermore, more clicks mostly lead students to a more than 50% completion rate. For example, the Lecture 5 video, which is 16.9 minutes in duration, took at least 4 to 5 clicks for students to complete more than 95% of the video; on the other hand, some students were able to finish the video in just one click. It is evident that students pause between the video recordings and attempt to complete them.
The results of this small study can have at least two implications. First, studying students’ characteristics while watching online learning videos can help teachers identify strategies to enhance the positive dimensions of behavioural and academic engagement. These positive behaviours include contributing to discussions and actively participating in academic, extracurricular, or non-academic activities (Fredricks et al., 2004). Second, identifying the video engagement gaps can help teachers act so that students develop academic skills contributing to their successful learning outcomes. This implies that using lecture videos in online learning can enhance students’ engagement when properly designed and uploaded, such as when to upload the videos, determining video length etc., of the videos. In addition, it showed the importance of teachers understanding and identifying the characteristics of engaging videos to enhance students’ engagement in online learning.

**Conclusion**

This study used ten lecture video recordings of a higher education course to analyse university students’ behavioural engagement based on their viewing patterns, such as video completion rate, viewing duration, time of view, viewing dropout and frequency. For example, it was seen that despite the short video duration, the dropout rate was higher, where students did not even watch half of the recorded video. The percentage of average minutes delivered over the minutes delivered is between 2 to 3%, which indicates that more students drop out of the recorded videos at a very early stage. This could be further investigated as to what hurdles could lead to students dropping out of the recorded lecture videos.

In the end, the small sample and limited data source can influence the generalisability of the study. Future research could benefit from more robust samples and data sources; however, these results can have implications for improving students’ learning from online lecture videos.

**References:**


