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Australian university students' access to web-based lecture recordings and the relationship with lecture attendance and academic performance

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Web-based lecture technology (WBLT) allows students access to recorded lectures delivered live to the classroom any time and to any device with internet. This technology has become standard across universities. This study of Australian undergraduate psychology students explored many important questions related to WBLT. About 75% of students surveyed utilised recorded lectures. Qualitative responses allowed students to explain many reasons for using WBLT, including to study for exams, regular study throughout the semester, to catch up on lectures they missed attending, and to clarify specific parts of the lecture. Four types of students were identified. Those who: (1) attended lectures regularly and did not access recordings; (2) attended most or all lectures and also accessed recordings to reinforce learning and for exams; (3) attended lectures but when they missed class accessed recordings; also accessed to reinforcing learning and for exams; and (4) did not attend lectures (by choice or due to personal circumstances) and only accessed lecture recordings. No differences in final grades were found based on higher/lower lecture attendance or higher/lower access of lecture recordings. It is concluded that WBLT is flexible, allowing students to apply it in different ways and the different patterns are related to similar academic achievement.

Introduction

Many lecturers are now recording face-to-face lectures on a regular basis, using web-based lecture technologies (WBLT) and providing students with 24/7 access (Gosper et al., 2010; Preston et al., 2010). These recordings capture what the lecturer says along with whatever is shown on the computer screen (PowerPoint, video, etc.). Students can stream or download the recordings and they can start and stop at any point, meaning they can pause to take notes, review certain parts, and choose only some parts to view. All Australian universities have lecture-recording programs, and Echo360 is the most common technology (Sankey, 2013). In order to maximise student learning, it is essential to know how the WBLT is being incorporated into learning and the impact it has on academic outcomes.

First, it is important to know how many students are using the technology. With the changing nature of technology and its comfort of use by students, this is hard to determine in the existing literature. An earlier study in the United States found only 3% of students were using audio recordings of lectures (Grabe & Christopherson, 2008), however, this study was conducted several years ago and as the technology utilised now is more sophisticated than just audio, this estimate should be considered out of date. For this reason, research published since 2010 was the focus of the literature review. Several years later another study at a British university using Echo360 (the lecture recording technology used in this study) found that each lecture was downloaded by about 50% of the student cohort. A survey of this cohort found 52% of students who utilised WBLT only did so for one or two lectures and most only looked at a few difficult slides (Leadbeater, Shuttleworth, Couperthwaite, & Nightingale, 2013). Only 10% viewed entire lectures. These findings if these two studies are quite difference, and it is uncertain how Australian universities would compare. While some lecture-recording systems do provide usage data (which recordings and how many minutes are accessed), without students being able to explain their usage it is hard to interpret.

A greater understanding of the different ways students access the technology is also important. Traditionally lecture attendance was required for students, but lecture recordings have made neither attendance nor accessing the materials online mandatory. Students have the opportunity to choose one medium or both. Some research has examined different ways students access the technology available online, including: having more control over their learning; substituting for missed attendance; and assisting students with disabilities or language challenges (Kay, 2012). Research into video lectures found different usage patterns. Those with more experience with the technology, who viewed full videos instead of parts and watched longer videos, reported higher intentions to access the technology (Giannakos, Jaccheri, & Krogstie, 2016).

Universities have felt pressure to provide technology in response to student demand. Students report their experiences are very positive and they access WBLT due to family commitments, work, timetabling clashes, and health (Gorissen, van Bruggen, & Jochems, 2012; Gosper et al., 2010; Preston et al., 2010). Among students who accessed video-recorded lectures, one study reported 95% of students at a university in Singapore agreed that the technology was useful (Soong, Cheers, & Hu, 2006). A study of four Australian universities found 76.3% of students who accessed WBLT had a positive experience and 79.9% said it made it easier to learn (Gosper et al., 2010). Students who are dyslexic or come from a non-English speaking background are more likely to be significant users of the lecture recordings (Leadbeater et al., 2013).

On the other side, lecturers have a very different perception and many are reluctant to endorse the inclusion of WBLT. One study reported only 49% of staff reported they believed WBLT made it easier to learn. The greatest differences between students and staff perceptions were about whether students could learn just as well from WBLT as face-to-face; 68% of students agreed, but only 3.2% of staff agreed (Gosper et al., 2010). Lecturers are particularly concerned about the impact WBLT has on in-class attendance because the recordings allow students to prioritise other commitments (Preston et al., 2010). However, recent meta-analysis concluded the access of WBLT in a class did not have a deleterious impact on in-person attendance (Kay, 2012; Kinash, Knight, & McLean, 2015), but a quasi-experimental study that only made the recordings available to half the students found they did attend class less frequently (Traphagan, Kucsera, & Kishi, 2010). This contrast of opinions and findings shows more empirical evidence is necessary from both students who access WBLT and those who do not, plus data about in-person attendance.

The relationship between WBLT and academic performance is important to understand. One study compared the exam grades of WBLT users and non-users and found no differences, however, the non-users likely included students who regularly attended lectures and those who did not (Leadbeater et al., 2013). The availability of online lecture recordings has been found to have a negative impact on attending classes, though this doesn't necessarily have a poor impact on grades (Traphagan et al., 2010). Wieling and Hofman (2010) did include both lecture attendance and access of lecture recordings in their analysis of the final grades for a sample of Dutch law students. Their study found students had better overall academic performance when they attended more lectures and viewed more lectures online. Further analyses led to the conclusion that using WBLT and attending lectures in person were nearly equivalent in predicting grades. Another study found students scored similarly on weekly quizzes whether they were randomly assigned to attend the lecture in person or to view it online (Jensen, 2011). Students also report that they learn the material better when they can access the recordings to help prepare for exams, reviewing parts of lectures they attended that were unclear (Aldamen, Al-Esmail, & Hollindale, 2015). There is important evidence for the effectiveness of WBLT, though additional research from varying educational settings and diverse students is necessary, especially as only a few studies have been conducted, they were a number of years ago, and the technology and students' access to it is constantly evolving. The particular ways some students combine lecture attendance and access to lecture recordings is of particular interest.

Rationale

Much of the existing research is based on students who do access the technology and it is unclear what percentage of Australian university students are likely utilising what is available. Students need to be given the opportunity to explain how they access the technology. Increasing technology access among students mandates that research is continuously renewed. The flexibility of the technology means students can incorporate WBLT in different ways and there is little in the existing literature about this. The current study provides important information about how and why students are using both WBLT and in-class lecture attendance to facilitate learning, as well as examine the relationship with academic outcomes.

Research questions

1. How many students access WBLT, how often do they access recorded lectures, and how many lectures do they attend?
2. How do students describe the reasons why they do or do not access WBLT?
3. How many students fall into each of the following four groups, and is there a primary usage pattern?
   a) attend 50% or more lectures and access WBLT for less than 50%,
   b) attend lectures and access WBLT for 50% or more,
   c) access WBLT for 50% or more and attend less than 50% of lectures, or
   d) attend and access WBLT for less than 50%.
4. Are there differences in final results for students with different patterns of attendance and WBLT access?

Method

Context

Undergraduate psychology students in a first-year and a second-year class were invited to participate in an online self-report survey about their access of WBLT during the previous semester. Both psychology classes captured all live lectures using Echo360. The audio included primarily the lecturers' verbal information, but also any audio from video clips presented. Little or no sound was audible from questions or comments from other students in the lecture. Echo360 also captured whatever was projected on the screen during the lecture: PowerPoint, websites, video, or other content from the computer. The audio and visual was linked and students accessed it simultaneously. Students logged into their student account and could then access the recordings at any time from any device with internet. When using the content on their own, students could pause, go back, look for specific PowerPoint slides and go directly to them, and download a file of the audio content alone. There were 24 hours of lectures and recordings (2 hours each week for 12 weeks).

Data collection

Self-report surveying following the end of the semester was chosen for students to report their final results and behaviours. Other studies of lecture recordings have used self-report methods, especially when self-report suited the research questions (Gorissen et al., 2012; O'Bannon, Lubke, Beard, & Britt, 2011). At the time of the study, the technology that logged individual student access to the lecture recordings was not available at the university, so the study was designed with this in mind and self-report suited the research. Limitations of the data from the online logs have been noted. Such logs can be misleading because students who only click on a link could be considered having accessed the particular lecture. Sometimes it is unknown to what extent a student utilises the material. Logs also lack context. Students who are only accessing recordings to clarify topics for a few minutes will appear the same as a student who briefly logged in and then stopped watching. In addition, when students download the content, researchers cannot tell if the students do or do not access the files. Such drawbacks to using online logs have been noted by other researchers (Aldamen et al., 2015; Traphagan et al., 2010). Due to these limitations to online data logs, self-report was concluded as a preferable method for addressing the research questions because of the interest in understanding if (rather than how much) students were accessing the technology and how they applied the technology in conjunction with attendance. Multiple-choice and open-ended questions allowed students to elaborate on their usage and provide important details for understanding the students' experiences (e.g., only using recordings to clarify lecture content versus accessing a lecture they missed attending in person). A mixed-method design was ideal for this study's research questions, which sought to quantify the number of students accessing the lecture technology, as well as allowing students to elaborate on their experiences qualitatively (Morse & Niehaus, 2016). Together this provided a clearer picture of the students who both attend lectures and access recordings, as well as the students who only attended or only accessed recordings, and why students made such decisions.

The survey link was provided on the class website and sent via email. The research was also briefly introduced during lectures that were also recorded. Prior to recruitment, the research was reviewed by the appropriate human research ethics committee and approval was granted.

Participants reported demographics and were asked to estimate how many lectures they attended in person. The second-year class had one 2-hour lecture per week and the first year class had two 1-hour lectures per week (12-week semester). In the survey, participants reported how many of the recorded lectures they accessed or utilised (0-12 for second year and 0-24 for first year). The definition of utilised was broad and later questions asked more details about what they did with the recordings. Participants next estimated how frequently they accessed the technology (weekly, fortnightly, 3-4 times, all at once). They responded to a multiple-choice question about which one item best described their access (missed attending a lecture, did not understand part of the lecture, study for an exam, cannot attend lectures, to complement weekly study, other). An additional open-ended question asked participants to elaborate on how and why they accessed the recordings so the students could explain several reasons. Participants who reported that they did not access WBLT at all responded to an open-ended question allowing an explanation for why they did not.

The last question was their self-reported final mark (0-100) in the unit. For ethical reasons (students and the researcher were familiar with each other), participants had to remain anonymous so official results from the university could not be accessed. In both units, 50% of the final mark comprised of exams, based on the lecture content (one exam for first year and two for second year), and 50% was written assessments, primarily introduced and discussed in seminar and laboratory classes.

Data analysis

Statistical Package for Social Science (SPSS) software version 22 was used for quantitative analyses. Descriptive statistics were used to answer research question 1 in order to describe patterns, and a nonparametric test (chi-square) was used to determine if any pattern of technology access was more likely than others. Research question 2 was analysed using thematic analysis of qualitative, open-ended questions (Morse & Niehaus, 2016). Each open-ended answer was carefully read and reviewed several times to consider the main message or meaning of the participant's response. Notes were carefully written, and when possible the words of the participant were used to create themes. Next, similar responses were combined into similar themes. Each participant's responses could be coded into more than one theme if appropriate. Research question 3 was also analysed using chi-square, and Levene's test assessed differences in the group's final results. Ultimately, additional thematic analysis was used in conjunction with the quantitative data to describe the student types that emerged from the results of the four research questions.

Results

Participants

A total of 71 Australian psychology students completed surveys; 46 in second year and 25 in first year. A majority were full-time students (85.7%) and female (77.9%). The mean age was 23.53 (SD = 7.6) and the percentage of mature-aged students was 35.1%. A majority (92.2%) had an English language background (English only or English plus another language).

WBLT access

A majority of participants did report using WBLT (N = 58, 75.3%). Figure 1 displays the reported frequencies. Nineteen students (24%) did not access WBLT at all and 17 participants (22.1%) accessed all of the recorded lectures. Among all students, participants accessed an average of 51.6% of the WBLTs. Excluding the students who did not access WBLT, the students who did access the technology reported they accessed 69.8% of the available weekly or bi-weekly lecture recordings. Even though there were two first year lectures each week and just one second year lecture, there was not a significant difference between year 1 and year 2 WBLT access, $t(71)$ = .147, p = .883.
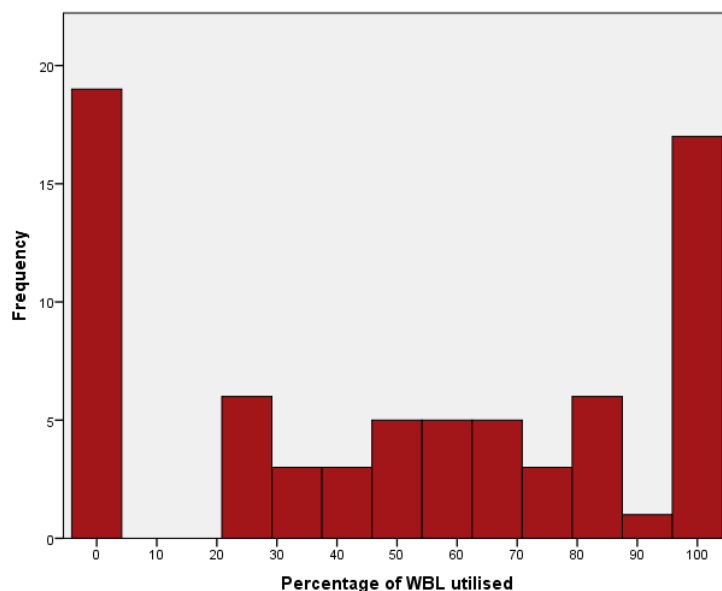

Figure 1. Frequency of students who self-reported the percentage of lecture recordings they accessed during the semester

Lecture attendance

Participants reported they attended a mean of 62.1% of the lectures. Figure 2 shows the frequencies for lecture attendance. Fourteen participants (18.2%) attended all of the lectures and four (5.2%) did not attend any. Even though there were two first year lectures each week and just one second year lecture, there was not a significant difference between year 1 and year 2 attendance, $t(71) = -.179, p = .858$.
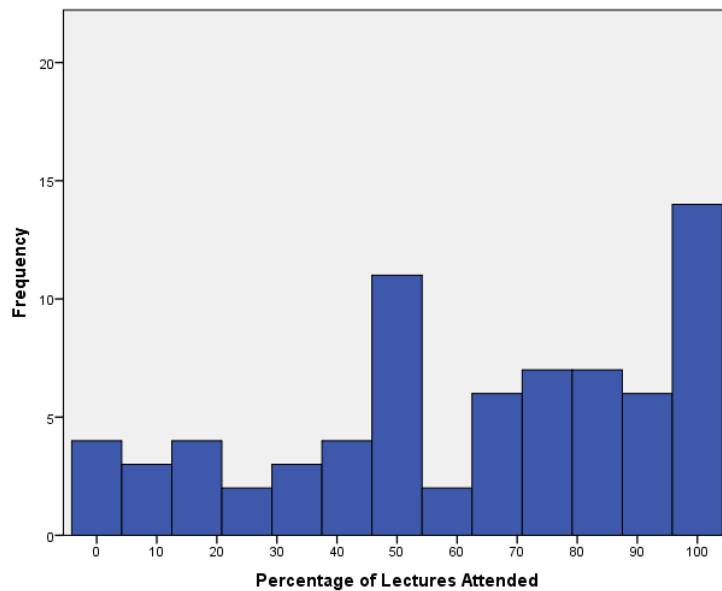

Figure 2. Frequency of students who self-reported percentage of lectures they attended in person

Frequency accessing WBLT

Students were asked a multiple-choice question about how frequently they accessed WBLT (Table 1). The frequency for accessing the recorded lectures varied and there was no prevailing pattern, χ^2 ($N = 54$, 3) = 6.593, $p = .086$, indicating there was not a more commonly reported frequency.

Table 1
Frequency accessing WBLT

Frequency $N = 73$	Percent	Responses to the multiple-choice question: What best describes how frequently you used the lecture recordings?
19	26.0%	Did not access WBLT
19	26.0%	Weekly
15	20.5%	Fortnightly
14	19.2%	3-4 times during the semester
6	8.2%	All at once

Reasons for using and not accessing WBLT

Students responded to a multiple-choice question asking what best described why they accessed lecture recordings (Table 2). Though studying for exams and using the recordings when the student missed attending were the most frequent, there was not a significant difference in the frequency of the reported responses, χ^2 ($N=52$, 3) = 6.269, $p = .180$. This indicates the technology is not being utilised in the same way by all students.

Table 3 also shows the results from the open-ended question, which was completed by 54 students. Participants were able to explain multiple reasons for WBLT and reported a total of 98 items with an average of 1.8 (*SD* = .85). Studying for exams was again the highest frequency response, but using the recordings to study rated slightly higher when the participants were given the opportunity to elaborate on their usage.

There were 19 students who did not access the technology and they explained a number of reasons why (Table 4).

Table 2
Reasons for accessing WBLT from multiple-choice question

Frequency	Percent	Responses to multiple-choice question: What BEST describes how you use the lecture recordings?
16	30.8%	Study for exams
13	25.0%	Missed attending the lecture
9	17.3%	Did not understand certain part of lecture
8	15.4%	Cannot attend lectures
6	11.5%	Complement weekly studying

Note. N = 54

Table 3
Reasons for accessing WBLT from open-ended questions

Frequency	Percent	Reason	Example response
26	26.5%	Study for exams	During the exam period I looked through the recordings to revisit concepts I didn't completely understand.
20	20.4%	Review a specific part of the lecture to clarify	I try to attend every lecture and if I do not understand something in a lecture I will go back and use the lecture recording.
19	19.4%	Accessed recordings in various ways as part of regular studying	I learn more from the lecture recordings rather than going to the lecture because when I am unsure of something I have the time to pause the recording and make an understanding of the topic then continue on.
15	15.3%	Missed attending a particular lecture	To go over any lectures I missed due to illness or work commitments.
9	9.1%	Regularly cannot attend lectures at all due to other commitments (family, work, sport)	I initially took time off work to attend the lectures … I found that the lecture recordings gave me the same experience as attending, so I used the recordings … I have only attended one lecture this semester.
2	2.0%	Long commute	Because I live 2+ hours away (public transport) so it was easier to watch a recording instead of traveling to the university.
1	1.0%	English is second language	English is my second language so it is useful to have the lecture recordings.
98		Total	

Note. N = 54.

Table 4
Reasons reported for not accessing WBLT

Frequency	Reason	Example Response
9	Attended lectures	I attended every lecture and took detailed notes so I didn't feel the need to listen to the lectures again.
6	Technology issues or did not know how to access	I couldn't get them to work.
4	Relied on the provided PowerPoint slides	The lecture notes were available online and it was easier and more convenient to use those instead.
1	Used the textbooks to study	[U]sing the textbooks as I understood it better from them.
20	Total	

Note. N = 17. Two participants did not respond to this question.

WBLT, lecture attendance, and final results

Lecture attendance and WBLT access were categorised as less than 50%, and 50% or more. Frequencies of students were grouped according to attendance and WBLT access (Table 5). The results of a Pearson's chi-square test of independence explored whether students were significantly more likely to fall into particular groups. The results bordered on significance, but were not significant, χ^2 (1, N = 73) = 3.44, p = .064. In addition, one group had the minimum cell size allowed for chi-square analysis (five people), so the non-significant result could be misleading.

Because there were only two valid responses for the group of students who attended and accessed less than 50% of both, further analysis did not include this group. A one-way between groups analysis of variance (ANOVA) was used to explore the differences in final results for the other three groups of students. An examination of skewness, kurtosis, and Shapiro-Wilk indicate the data was normally distributed in all groups. Data was also homogenous, as Levene's test was non-significant, F (2, 56) = 2.02, p = .143. Table 6 displays the means and standard deviations for the final results. The result of the ANOVA was not statistically significant, indicating there was no difference in final results for the students grouped by lecture attendance and WBLT access, F (2, 56) = .23, p = .794.

Table 5
Number of students reporting lecture attendance and WBLT access

	Lectures Attended	
WBLs Accessed	Less than 50%	50% or more
Less than 50%	5	26
50% or more	15	27

Table 6
Mean final results for lecture attendance and WBLT access groups

	Lectures Attended	
WBLs Accessed	Less than 50%	50% or more
Less than 50%	*	75.5 (8.2)
50% or more	74.1 (13.7)	73.5 (9.8)

Note. * Not enough data, only 2 participants completed the question. Standard deviations in parentheses.

Discussion

This study was on a small scale but provided important data on how students access education technologies. Information about how many students access WBLT, frequency, and why they access the technology is important for lecturers and universities. The relationship to final marks provides vital data that has not been examined in previous studies. Lecture recordings clearly can complement face-to-face teaching.

The first research question was about the access of WBLT. Approximately 75% of students who participated in the survey did access WBLT, at least at some point during the semester. Clearly, lecture recordings are now an important component of the university experience but are not universally accessed. It is not simple to compare these results to other studies because there are many unique variables and/or different methods. A United Kingdom study by Leadbeater et al. (2013), similarly concluded that 75% of students who participated in a survey utilised the lecture recordings. However, a Canadian study found only about 36% of students accessed lecture technology, though students did not have to consent for their data to be included in this analysis so all enrolled students' usage patterns were analysed (Brooks, Erickson, Greer, & Gutwin, 2014). However, in this Canadian study the definition of *use* was very generous and meant a minimum of 5 minutes during the semester, so the access to the current study appears to be quite different.

The current study found only 22.1% utilised all of the recorded lectures. This figure is still higher than what was found in the United Kingdom study, which found 10% accessed all of the recordings (Leadbeater et al., 2013). The current study and the United Kingdom study found similar percentages of the cohorts utilising the recordings; around 50%. Students who did access WBLT (but not for all lectures) were quite evenly distributed between a 25% and 80% of lectures, indicating a variety of purposes, goals, and motivations for using WBLT. It is important that no majorities in student access were found; students' reports reflect the flexibility of the technology. Some students still prefer to attend lectures in person, indicating that lectures should not be

considered obsolete. Also the students who lecturers do not see in their lecture halls are often utilising the recordings and report they are confident they are getting the same information. As one student reported:

> I initially took time off work to attend lectures, and then missed a few when I was not able to leave work. I found that the lecture recordings gave me the same experience as attending, so I used the recordings.

There was no prevailing pattern of frequency. Students were not more likely to access WBLT weekly, fortnightly, three to four times during the semester, or all at once. The flexibility of WBLT is one of the hallmarks of the technology and these results indicate many students do adapt and access the technology in different ways that suit their needs. In the current study, 26% of participants reported using WBLT weekly. Many students who accessed the recordings less frequently were attending the lecture instead. However, this result is significant for educators to understand that students will not all have attended and/or accessed the recordings in a given week. This presents certain challenges to teaching content that builds with each consecutive lecture. Needs are also likely impacted by differences at universities and courses of study, for example, Brooks et al. (2014) found about 8% of the Canadian students in their study were using recordings on a weekly basis, while Aldamen et al. (2015) found 75% of the Qatari students in their study were using weekly. Gorissen et al. (2012) conducted a study at two universities in the Netherlands and found interesting attendance differences at the two locations (i.e., 44.7% versus 29.3%) and attitudes about recorded lectures (i.e., effectiveness in course success was 90.3% versus 66.5%), stressing the point that key differences in institutions and classes exist necessitating educators to become familiar with the unique experiences and needs of their students.

The second research question addressed the reasons for accessing or not accessing WBLT. The 53 students who attended more than half of the lectures were nearly evenly split between high and low users of WBLT. It was interesting to find such a large group of students who both attended and accessed the recordings—either to supplement their studying or to make up for a missed lecture. Of the 20 students with low attendance, 15 were high users of WBLT. It is encouraging that there were not many students who were not acquiring the lecture content in either form (attending lectures or accessing the recordings). Similar to other findings of WBLT access, even combined with lecture attendance, there is not a dominant pattern and students were not more likely to report a particular reason for deciding to access recordings. Students who accessed the recordings reported interesting and varied methods, as well as many reasons for using the recordings – either exclusively or in conjunction with attendance. Many checked specific parts of the lecture they didn't understand during their attendance.

The third research question explored how students could be grouped based on attendance and WBLT access, and the qualitative data allowed for greater description of how students' patterns can be understood. Figure 3 describes four very general types of students suggested by the results of this study. Some students preferred recordings or found it easier to incorporate study into their personal lives (type 4); one student reported: "I had footy training on during lecture time, so I watch (sic) the recording to make up for missed content." Not all students who accessed the recordings were missing classes and these were the type 2 students; they attended most lectures and had many uses for the recordings. For example, one type 2 student reported accessing the recordings "to go over material again and listen it over and over again to get a better understanding." Type 3 students were those who relied on the recordings when they missed class, but like type 2 students had other ways of accessing the recordings for study. A type 3 student said:

> I try to attend every lecture and if I do not understand something in a lecture I will go back and use the lecture recording. I had a family emergency last semester and I hate to miss attending the lecture but I had no other choice so it was good to have the lecture recording as a backup.

Many explained how they listened to the lectures while traveling, cleaning, while reviewing PowerPoints, making flash cards, and checking over notes from class (types 2, 3, and 4). This is important information for educators (especially those who might feel reluctant to embrace the technology) to gain a picture of some of the students who are not in the lecture theatre. It's also important to take into account the experiences of students who chose not to access the recordings (type 1). This group of students was quite satisfied with getting their information from the lecture theatre exclusively. One type 1 student reported: "I don't find them [lecture recordings] the best way for me to study. I learn better from reading the notes and then re-writing them myself." The analysis indicates that both modes of lectures are essential.
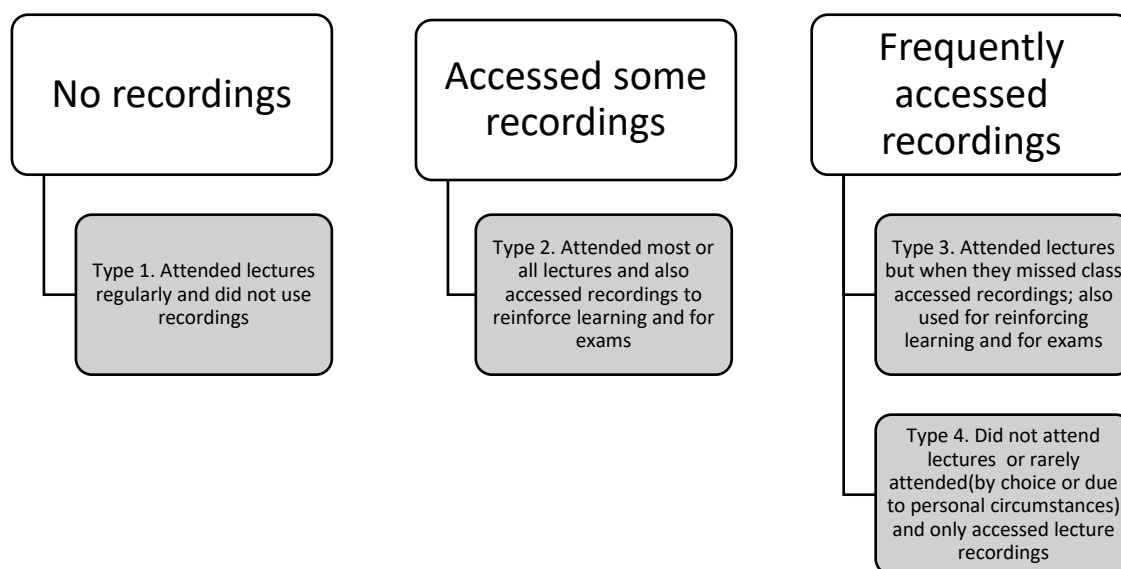
No recordings	Accessed some recordings	Frequently accessed recordings
Type 1. Attended lectures regularly and did not use recordings	Type 2. Attended most or all lectures and also accessed recordings to reinforce learning and for exams	Type 3. Attended lectures but when they missed class accessed recordings; also used for reinforcing learning and for exams
		Type 4. Did not attend lectures or rarely attended(by choice or due to personal circumstances) and only accessed lecture recordings

Figure 3. Characterisation of student types based on access of lecture recordings and lecture attendance

This study did find a relationship between lower lecture attendance and greater WBLT access, though there was not a deleterious impact on outcomes. Some students reported that WBLT was what they turned to if they missed a lecture due to illness or other reasons. Additionally, a group of students could not attend regularly at all, and two students cited long commutes discouraged attending in person. It might be assumed that without WBLT there are some students who could not study these classes. The recordings also made it possible to fit study in with their life circumstances. One student wrote:

> Due to time, I was unable to attend one of the lectures every week. I watched it on my home PC with my printed notes and also watched a couple of extra ones I either missed from the other series or wanted to brush up on before exams. I have 3 children and live an hour and a half from [campus] so to attend one a one hour lecture is not worth the hassle and travel.

Previous studies have not been consistent in the relationship between lecture recording availability and attendance. Some found having WBLT did not impact attendance (Aldamen et al., 2015; Kinash et al., 2015) and another study found access to WBLT did reduce attendance (Traphagan et al., 2010). Perhaps the different contexts at universities, such as longer commutes to campus and fewer regularly scheduled classes as in the current study mean having WBLT available does change attendance patterns.

A number of students also accessed WBLT to facilitate studying – even for lectures they had attended in person (types 2 and 3). Many reported they would go back to specific parts of the recording for clarification. Some United Kingdom students also reported that they often only accessed the recordings to review to specific parts of the lecture (Leadbeater et al., 2013). Many Belgian students saw the advantage to having lecture recordings while studying for exams (Montrieux, Vangestel, Raes, Matthys, & Schellens, 2015). In the qualitative questions, some students elaborated on unique strategies (e.g., taking notes, downloading to phone, and listening to the lectures over and over). The technology has been designed to be flexible to allow students with different needs and different learning preferences and experiences, to adapt it and maximise the benefit, and there is evidence that this is happening. It was surprising that only one student cited their non-English background and no students mentioned learning disabilities as a factor in utilising WBLT. It was expected this would be a more common response because Leadbeater et al. (2013) found these students to be more likely to access WBLT. It is important for educators to be aware of the different ways the technology can and is being accessed, in order to guide students in study strategies and to ensure their access to the technology works.

There is also a link between lecture attendance and non-access of WBLT. One-quarter of students did not access WBLT at all (type 1) and there has been less research about this group. The most common reason for students to say that they did not access the WBLT is because they did attend the lectures. A lot of students reported they didn't miss attending any lectures, so they didn't need to make up for missing class with the recordings. Some students perhaps see the technology as redundant if attending in person, as has been

indicated by students in other studies (Montrieux et al., 2015; Traphagan et al., 2010). There will always be some students who prefer to learn in a face-to-face manner, despite the varying ways students can utilise the recordings (Kay, 2012; O'Bannon et al., 2011).

The technology was not an overwhelming barrier and only six students cited problems with getting WBLT to work that prevented them from utilising the recordings. Because the majority of students had no problems, it is likely these were isolated cases (maybe due to the individuals' computers) and not indicative of system-wide problems. It is reassuring that the technology is functioning as it is intended, but perhaps some students can still be made more aware of IT support from the university for WBLT available to them, even when off-campus. Other studies have also found that many students report that the quality and accessibility of the technology is good (Aldamen et al., 2015; Montrieux et al., 2015).

The last research question looked at differences in final results, which is an important contribution of this study. No differences were found in final results for students with different lecture attendance and WBLT access patterns. This result contributes to previous research which similarly found no differences in grades comparing students who did and did not access WBLT (Leadbeater et al., 2013), however, the current study takes into account lecture attendance. This indicates that despite different combinations of lecture attendance, WBLT and associated study techniques used by students, the outcomes are comparable. Similar conclusions were made by Wieling and Hofman (2010) and Kinash et al. (2015), augmenting these results. However, because there was only a small group of students with low attendance and low WBLT access among the participants in the current study, the final results for this group could not be analysed. Also because no participants reported that they had failed, the role of attendance and recording access (or lack thereof) cannot be used to understand why students fail.

Strengths and limitations

This study provided important information about WBLT for Australian psychology students, providing data for questions about access and non- access of WBLT, the relationship with in-person attendance, and final results that have not been addressed by existing research. Clearly, there is no prevailing pattern for how WBLT is utilised or the frequency of access (weekly, fortnightly, or 3-4 times). The qualitative responses were important, allowing students to describe what they did during the previous semester. The online activity logs would fail to account for the strategies and reasons students explained for their access to the recordings in this study.

One important limitation to recognise is the sampling. First, the survey was only introduced to students in the semester following the semester that they were asked questions about. Though this timing was necessary in order to have complete data (students' complete attendance, WBLT access, and final results), this meant the participation was limited to students who passed the unit in question (a prerequisites for semester 2) This biased the sample in favour of stronger students. This sample of students might have different WBLT access, attendance, and final results compared to students who did not participate in the survey. Based on informal data from lecturers in these classes, a typical lecture would have about 25% attendance, which is much lower than the reported attendance for the sample of around 60%. Students might also have inaccurate recall of their attendance and how often they access the WBLT. Second, because the survey was voluntary the students who chose to participate might have particular motivations to express their experiences with the topic of WBLT. This too could bias the sample and impact the results, especially the self-reported final mark data. As was seen in the results, the low attendance and low WBLT group had only five students and had incomplete data for the final result. Students with low attendance and not using the university online platform would not have been informed about the study, so less is known about the students who are not engaged with either mode of lecture.

Future research

The current study found no differences in final marks based on attendance and WBLT access. Future research could explore whether different types of academic motivation, learning approach (i.e., self-directed), are associated with students who tend to primarily attend lectures in person, those who primarily access WBLT, and students who utilise both. Students with different patterns might also report different learning experiences. It is possible that different types of study preference and motivations are best suited to lecture attendance, WBLT, and both. However, some students might not choose the study modes that best suit them – they make a decision based on other factors (like convenience or tradition). Leadbeater et al. (2013) also speculated whether recorded lectures encouraged a surface learning approach, and this warrants further investigation.

Some patterns of access found in the current study might also be associated with different attitudes, as Giannakos et al. (2016) found with video lectures.

Implications

The results of this study have implications for educators, students, and university administrators. The results provide student types for lecturers to gain insight into how some students are using the lecture recordings—students they may infrequently see in the lecture hall. Students can also gain ideas for their own study routines from the experiences of the participants and the patterns identified in this study. The findings indicate that flexibility in how students utilise the online resources and lecture attendance is important; students would not support strict or mandatory attendance and access of the online resources, so it is important for universities and lecturers not to be rigid. Providing options for students and encouraging students to adapt to their needs is the ideal approach for the educators. However, lecturers must clearly explain the options and some students might need support in choosing modes that will maximise their learning. University administrators should be aware of the patterns of access so they can ensure degree programs allow for the flexibility students need, as well as providing up-to-date technology and adequate support to faculty and students. More courses are taking a blended learning approach, where online resources (not just lecture recordings) complement face-to-face techniques, and universities in the future will need to continue to innovate. Additional online resources (quizzes, chat rooms, sharing of materials and videos) can also have the potential to increase engagement, which is especially important if groups of students attend less frequently and access more WBLT.

Conclusion

Many students have been quick to adapt to the learning technology now available to them, and there were no differences in final grades due to differences in how many recorded lectures accessed and how many lectures attended. This has important implications for educators who have generally worried about the impact of lecture recordings on attendance and so have been less enthusiastic about embracing the potential of WBLT. The technology is very flexible, and this was reflected in the different patterns of number of recordings accessed, frequency, and reasons why many students liked using WBLT or why others preferred not to access them. As new and improved education technologies are developed and adopted by more students, educators, and researchers must keep up with them in order to understand how to maximise student learning.

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