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Effect of lecture recording on student outcomes: A focus on pharmacy students

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ABSTRACT

Objectives: Lecture recording is a technology available to enhance learning by allowing students to review materials after class. Lecture recording provides many advantages including reviewing materials covered during missed classes, revisiting difficult or confusing materials, and accessing material as often as necessary to facilitate learning. Data surrounding lecture recording in pharmacy schools, specifically those with mandatory attendance, are lacking. The objective of this study is to determine if students at the University of the Incarnate Word Feik School of Pharmacy are using Lecture Capture (LC), a lecture recording system, appropriately and if the use affects their academic performance. In addition, the study evaluates student perceptions of lecture recording.

Materials and Methods: A survey was given to pharmacy students in their 2nd professional year and again in their 3rd professional year to assess their use of the lecture recording system, LC. Appropriate use was defined as listening to lecture segments to clarify confusing or complex concepts. The primary outcome was the correlation between semester grade point average (GPA) and appropriate use of LC. The secondary outcome was students' perception of the effect of LC on their academic performance.

Results: No statistically significant difference in semester GPA was found between students who use LC appropriately and those who use it inappropriately. However, the majority of students feel that using LC helps them earn higher grades.

Conclusion: The way in which LC is used does not affect student academic performance in terms of semester GPA but is associated with positive student perceptions.

Keywords: Lecture recording, Lecture Capture, Technology, Teaching and learning

INTRODUCTION

Lecture recording software is a technology used by several health-care professional schools, although the way in which it is used varies between institutions. The use of lecture recording software has multiple advantages including the ability to review materials covered during a missed class, revisit complex or confusing didactic materials, and access material as often as needed to facilitate learning.[1] Echo360© is a company that created and provides Lecture Capture (LC), a lecture recording system, to the University of the Incarnate Word (UIW) Feik School of Pharmacy (FSOP). The Echo360© LC system has multiple functions; however, FSOP utilizes this program for its audio/visual and recording functions. At this institution, faculty must record all required course time using LC. As class attendance is mandatory, the recorded lectures are

not meant to be a substitute for class attendance but rather serve as a resource for students to reference when needing to clarify complicated or difficult concepts.

Previous studies on the use of lecture recordings have been conducted in medical, nursing, and undergraduate students.[1-10] These studies have evaluated various aspects of lecture recordings including frequency and extent of use and effect on attendance, student satisfaction, and grades. These studies found that the majority of students accessed the recordings at least once.[1-4] The availability of recorded lectures results in reduction in attendance, with decreases of 10–20% reported.[5-7] Student satisfaction improved with the availability of recorded lectures.[5,8] The data available differ in regard to impact on examination grades, with some studies showing an improvement in grades while others found no benefit.[9,10]

At present, there are limited studies assessing outcomes in pharmacy students. A study by Bollmeier *et al*. conducted at the St. Louis College of Pharmacy assessed the correlation between students' access of online recorded lectures and their course grades and attendance.[4] The authors found no correlations between frequency and duration of student access to lecture recordings and the final course grade or class attendance. However, their results did not show that students scored significantly higher in their Therapeutics II course where lecture recording was provided compared to Therapeutics I course examination when lecture recording was not available.[4]

In 2013, Maynor *et al*. published a study evaluating the perceptions of students and faculty on lecture recordings at West Virginia University School of Pharmacy.[11] Second professional (P2) and 3rd professional (P3) year students and all full-time faculty members were surveyed. The availability of lecture recordings resulted in decreased attendance with 46% of students reporting being more likely to miss classes. The most common faculty concerns regarding lecture recordings included decreased attendance, decreased professional socialization, and decreased comprehension of lecture materials.[11]

A 2014 study evaluated the use of LC within the University of British Columbia. Faculty within the pharmaceutical science department recorded lectures in a classroom used by 1st professional year, P2, and P3 pharmacy students. The students were surveyed to evaluate their use of the recorded lectures as well as their perspectives. Over 80% of students viewed at least one lecture recording. Ten percent of students did not attend class but rather used the lecture recordings. Benefits identified by students included improved understanding of materials and knowledge retention as well as a better-controlled learning pace. The perspectives of the faculty surveyed mostly included feeling that LC did not affect the quality of student responses, class participation, or grades.[12] In 2020, the same authors published a follow-up study that re-evaluated student and faculty perspectives on the use of LC within the University of British Columbia.[13] Between the 2014 and 2020 studies, the use of LC increased from one classroom to eight classrooms. The vast majority (98%) of the students used the LC resource to some extent. Similar to the original study, the students cited the benefits of improved understanding and increased retention of materials. Many students (84%) responded that they missed fewer than 1 class per week despite LC availability. The faculty cited benefits of students being able to study more effectively and review important concepts.[13]

There is a deficiency of information on the use of lecture recording in pharmacy schools with mandatory attendance and how the use of these systems affects student outcomes. In addition, studies are needed to determine how students use lecture recording and if its use is optimal. This study sought to determine if students at the UIW FSOP are using LC appropriately and if the appropriateness of this use affects their academic performance. In addition, the study evaluated students' perceptions of LC.

MATERIALS AND METHODS

This single-centered study assessed survey responses from a cohort of P2 pharmacy students. Students were surveyed twice – first in the Spring of their P2 year and later in the Fall of their P3 year. The survey was first piloted with a group of pharmacy students in their 4th professional year and presented to pharmacy educators for feedback; the survey was then updated for clarity and completeness. Approval of the study was obtained from the UIW Institutional Review Board.

Students were included in the study if they were enrolled in a chosen cohort at the time of survey administration and if they provided informed consent. The student survey is provided in Appendix I. The primary outcome is the effect of appropriate use of LC on semester grade point average (GPA). Appropriate use was defined as using LC to revisit or clarify difficult or confusing topics or to listen to the entire lecture only if student was absent. The secondary outcome was students' perception of the effect of LC on their academic performance. Other outcomes assessed include the effect of LC use on semester GPA, the effect of a change in use on semester GPA, and use based on teaching style (i.e., lecture based, case based).

Statistical analysis

Analysis included all students who met inclusion criteria. The Student's *t*-test was used to evaluate the relationship between appropriate versus inappropriate use and semester GPA, the relationship between a change in use and semester GPA, and

the relationship between use versus no use and semester GPA. A Wilcoxon Rank Sum test was used to evaluate the effect of appropriate use of LC in social science courses on semester GPA, as the data did not follow normal distribution. Descriptive statistics were used to evaluate the students' perception on LC and its effects on their academic performance, use by course type, appropriate use by course type, and demographics. Data were analyzed using JMP Pro 14 software®.

RESULTS

A total of 66 students of the class of 90 students completed the first survey in the Spring of their P2 year while 51 out of 88 students completed the second survey in the Fall of their P3 year, resulting in survey response rates of 76% and 58%, respectively. Of the 51 students who completed the second survey, 82% (42) also completed the Spring survey. Demographics of the respondents categorized by semester can be found in Table 1.

The students used LC predominantly for pharmacotherapeutic courses (97.5%) and to a lesser extent in basic science (69%) and social science (28.5%) courses. There was no statistically significant difference found when comparing semester GPAs resulting from use and no use with the first survey administration (difference of −0.25 [−0.53–0.03], $P = 0.250$). Similar results were found in the Fall with the second survey (difference of 0.131 [−0.79–1.05], $P = 0.778$). These findings held true for the primary outcome as well [Table 2]. When reviewing appropriate use across all course types, 28.5% of respondents used LC appropriately. The remaining respondents were classified as inappropriate use as they reviewed lectures in their entirety or used a combination of reviewing lectures in their entirety and going back to clarify difficult or confusing topics. Both approaches are deemed inappropriate. When assessing course type independently, appropriate use occurred more frequently in social and basic science courses (62.5% and 51%, respectively) as compared to pharmacotherapeutic courses (32%).

Table 1: Demographics.

Characteristic	Spring results (*n*=66)	Fall results (*n*=51)
Male gender, *n* (%)	16 (24.2%)	10 (19.6%)
Age range, *n* (%)	20–24 years: 38 (57.6%)	20–24 years: 24 (47.1%)
Prior degrees earned, *n* (%)	Bachelor's: 31 (46.9%)	Bachelor's: 20 (39.2%)
Average GPA±SD	3.37±0.45	3.42±0.50
Hours spent/week on LC, *n* (%)	<1 h: 11 (19.0%) 1–5 h: 22 (37.9%) 5–10 h: 15 (22.7%) >10 h: 10 (22.7%)	<1 h: 9 (16.6%) 1–5 h: 19 (37.3%) 5–10 h: 8 (15.7%) >10 h: 6 (11.8%)

GPA: Grade point average, LC: Lecture Capture, SD: Standard deviation

Any change in LC use from the first administration of the survey to the second as compared to semester GPA was also evaluated. There was no statistically significant difference in semester GPA for students who used LC in the Spring but who did not use it in the Fall. This also held true for those who did not use it in the Spring but did in the Fall. Students were also asked about LC use based on class type (i.e., case based vs. lecture based) and the majority of students stated that they use LC more for lecture-based classes [Table 3].

Student perceptions of LC and its effects on their academic performance were also assessed. It was found that 75% of students who used LC believe that they earned higher grades with its use.

DISCUSSION

To our knowledge, this is the first study that defines and addresses appropriate versus inappropriate use of LC, change

Table 2: Appropriate use and semester GPA.

Courses	Spring 2018	Fall 2018
All	0.14 (−0.13–0.46), *P*=0.250	−0.80 (−2.10–0.50), *P*=0.218
Social science	0.21 (−0.40–0.52), *P*=0.777	P=0.266, Z=1.021[a]
Basic science	0.14 (−0.28–0.28), *P*=0.992	1.10 (−1.80–4.00), *P*=0.426
Therapeutics	0.13 (−0.18–0.34), *P*=0.573	0.14 (−0.17–0.45), *P*=0.366

[a]Used median and Wilcoxon Rank Sum; all others reported with 95% CI. GPA: Grade point average

Table 3: LC use based on class type.

For *case-based* learning I use LC:		
Response	**Spring 2018 (*n*=59) *n* (%)**	**Fall 2018 (*n*=43) *n* (%)**
Always	12 (20.3)	5 (11.6)
Frequently	13 (22.0)	8 (18.6)
Sometimes	18 (30.5)	19 (41.2)
Rarely	11 (18.6)	9 (20.9)
Never	5 (8.5)	2 (4.7)
For *lecture-based* learning I use LC:		
Always	18 (30.5)	8 (18.6)
Frequently	17 (28.8)	12 (27.9)
Sometimes	16 (27.2)	14 (32.6)
Rarely	5 (8.5)	9 (20.9)
Never	3 (5.1)	0
Which describes your use of LC?		
More in lecture based	30 (50.8)	21 (48.8)
More in case based	3 (5.1)	8 (18.6)
Same amount in both	23 (39.0)	13 (30.2)
No use	3 (5.1)	0

LC: Lecture Capture

in use as students' progress through the curricula, and use based on class type. Appropriate use was defined as use for the intended purpose of providing LC at UIW FSOP, which was to provide students with a supplement to class to help clarify confusing or difficult topics. Most student respondents used LC to listen to the lectures in their entirety or a combination of both revisiting confusing topics and listening to entire lectures.

When comparing the effects of appropriateness of use on semester GPA across all course types, there was no statistically significant difference. These findings persisted for comparisons among individual course types or of GPA between those who used and those who did not use LC. These results are consistent with the study by Bollmeier *et al*., who found no difference in course grade for students who used lecture recording compared to those who did not.[4] These findings suggest that the use of lecture recording does not affect student academic performance. Despite these findings, the majority of students who used LC still felt that they earned higher grades with its use. Although this design limits the number of included students, it did allow for evaluation of the change in LC use as students progressed through the program as well as LC use with two semesters of pharmacotherapeutic courses in addition to other courses.

The study is not without limitations. First, this study evaluated only one student cohort. Second, semester GPA was used to evaluate academic performance; however, GPA included laboratory courses and electives that do not use LC, which could also potentially skew the results. Third, recall bias could be present as students may not remember exactly how they used LC in each of their classes. Fourth, student-preferred learning type was not evaluated so these data cannot correlate learning style and effectiveness of LC. Future studies could evaluate the use of LC in an individual course compared to the corresponding course grade. In addition, future studies could use the lecture recording software to objectively quantify student use of LC versus asking students to self-report their use.

CONCLUSION

The appropriate use of LC was not associated with a higher semester GPA. The use of LC in any form, whether appropriate or inappropriate, was also not associated with a higher semester GPA, although students believe that LC use does help them earn higher grades. Further objective studies are needed to determine if the use of LC affects other academic outcomes, such as examination score, individual, and course grades.

Declaration of patient consent

Institutional Review Board (IRB) permission was obtained for the study.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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Appendix I: Lecture Capture Survey

1. I use Lecture Capture: (Select all that apply)
   a. Not at all (if chosen, please move to question 10)
   b. For social science courses (i.e. Ethics & Life issues, Public Health)
   c. For basic science courses (i.e. Biochemistry, Pharmaceutics)
   d. For therapeutics courses (i.e. PTV: Cardiovascular Disorders, PTVI: Pulmonary, PTIII: DEENT, PT IV: Renal)
2. I listen to Lecture Capture during class time.
   a. Yes
   b. No
3. I should be allowed to use Lecture Capture to challenge exam questions.
   a. Yes
   b. No
4. For social science courses (i.e. Ethics & Life issues, Public Health), I use Lecture Capture to:
   a. Revisit and clarify complicated or confusing topics
   b. Listen to entire lectures
   c. A & B
   d. Other: _____
   e. I do not use Lecture Capture for social science courses
5. For basic science courses (i.e. Biochemistry, Pharmaceutics), I use Lecture Capture to:
   a. Revisit and clarify complicated or confusing topics
   b. Listen to entire lectures
   c. A & B
   d. Other: _____
   e. I do not use Lecture Capture for social science courses
6. For therapeutic courses (i.e. PTV: Cardiovascular Disorders, PTVI: Pulmonary, PTIII: DEENT, PT IV: Renal) I use Lecture Capture to:
   a. Revisit and clarify complicated or confusing topics
   b. Listen to entire lectures
   c. A & B
   d. Other: _____
   e. I do not use Lecture Capture for therapeutic courses
7. For courses that use case-based or team-based learning (i.e. therapeutics portions of PTV: Cardiology, PTVI: Pulmonary), I use Lecture Capture:
   a. Always
   b. Frequently
   c. Sometimes
   d. Rarely
   e. Never
8. For lecture-based therapeutics courses (i.e. PTIII: DEENT, PT IV: Renal), I use Lecture Capture:
   a. Always
   b. Frequently
   c. Sometimes
   d. Rarely
   e. Never
9. Which best describes your use of Lecture Capture more often in lecture-based therapeutics classes (i.e. PTIII: DEENT, PT IV: Renal) as compared to case-based or team-based learning therapeutics courses (i.e. therapeutics portions of PTV: Cardiovascular Disorders, PTVI: Pulmonary).
   a. I use Lecture Capture more in lecture-based courses
   b. I use Lecture Capture more in case-based or team-based learning courses
   c. I use Lecture Capture the same amount for each course type.
   d. I do not use Lecture Capture for either course type.
10. On average, I use Lecture Capture approximately _____ hours per week.
    a. <1
    b. 1-5
    c. 5-10
    d. >10 hours
11. I believe that I earn higher grades when I use Lecture Capture.
    a. Yes
    b. No
12. Prior to pharmacy school I earned a:
    a. 4-year Bachelor's degree
    b. Master's degree
    c. Other: _____
    d. Neither
13. Age
    a. <20 years old
    b. 20-24 years old
    c. 25-29 years old
    d. ≥30 years old
14. Gender
    a. Male
    b. Female