EDUCATION
RESEARCH SERVICE

AWARD WINNING ORIGINAL ARTICLE

Classroom recordings: Utilization and influence on course performance

Amberly A. Ferguson, DC and Lia M. Nightingale, PhD

ABSTRACT

Objective: Providing video recordings of lecture material may enhance student flexibility, but does it alter attendance or influence their grade? This project assessed the extent and purpose of video usage by students and evaluated their impact on course performance within first-year basic science courses in a chiropractic curriculum.

Methods: All first-year students enrolled at a chiropractic college based in the United States were invited to complete a retrospective survey regarding video usage, attendance, and study behaviors for basic science courses they were enrolled during the previous term. Grades were third-party obtained for each consenting student. Statistical analysis included descriptive statistics and independent *t* tests for each course. Effect size using Cohen's *d* was calculated for all statistically significant courses ($p < .05$).

Results: Overall, 260 students completed the questionnaire assessing 18 courses in total. The perceived helpfulness of video recordings was associated with heavier usage, primarily to study for exams. Shorter summary videos were preferred by 78% of students over full lecture recordings. Use of videos to replace lectures increased from 21.9% to 53.2% in first through third trimester, respectively. Video use in Neuroanatomy I, Neuroanatomy II, Gross Anatomy II, Organ Histology, and Endocrinology were associated with lower exam scores and overall grades ($p < .05$), yielding moderate to large effect sizes.

Conclusion: Videos were used < 1 hour per week, primarily to study for exams. When used as a study tool, video use decreased course performance. Rewatching videos to prepare for exams may be mistaken for mastery of material.

Key Indexing Terms: Chiropractic; Education; Science; Students; Video Recording

J Chiropr Educ 2024;38(2):92–99 DOI 10.7899/JCE-23-21

INTRODUCTION

On May 11, 2023, the US Federal Public Health Emergency for COVID-19 officially ended, but educators are still feeling the repercussions it had on their classroom dynamics. The quick transition between in-person to 100% online, to hybrid instruction, and then back to in-person instruction, COVID-19 changed the landscape in which classes were conducted. Brick-and-mortar institutions had to quickly overcome many challenges. Faculty had to be creative and experiment with new ways to deliver material through technology.[1] Although the transition to online learning was forced on educators, many felt it helped them become more fluent in classroom digital technology.[2] Learning management systems (LMS) were extensively utilized prior to the pandemic, but integration with video conferencing software with recording capacity greatly increased their classroom utility as they could now be used for video capture. The transition between online, hybrid, and the eventual return to in-person instruction allowed educators to determine the best way to proceed with newly learned tools and resources.[2]

Previously, attendance was shown to be the most accurate predictor of academic performance in both undergraduates and medical students.[3–5] Poor attendance has been a topic of concern for decades and continues to worsen, especially with the introduction of recorded options.[6–8] Other factors impacting live lecture attendance include personal learning preferences, desire for greater autonomy, and perceived low value of the course.[8] Lack of student attendance is a source of frustration for faculty since class time is a valuable opportunity to assist students as they develop their knowledge and clinical skills.[9] After quarantine and social-distancing restrictions were lifted, educators hoped students would sprint back to campus and the joy of teaching to full classrooms would return. Since COVID-19, attendance has significantly declined.[10] Learners who opt for online options over live lecture often do so to have autonomy over lecture timing, control of video speed, and perceived improvement in productivity by utilizing lecture time to study for other courses.[4] Providing lecture capture videos may have

This paper was selected as a 2023 National Board of Chiropractic Examiners Research Award at the Association of Chiropractic Colleges–Research Agenda Conference.

First Published Online April 24 2024

benefits for students, such as providing better work-life balance, helps fill in gaps missed, captioning can help overcome language barriers and provides support for those with disabilities, and offers students an opportunity to revisit difficult material.[11] Students may choose to study for other courses, whether in class or by not attending, due to time constraints and perceived efficiency. In essence, putting themselves further behind on course material and negatively impacting subsequent course performance.[12–14] Video technology is not without its disadvantages. Along with declining attendance, other disadvantages include frequent technical difficulties, lack of classroom interaction, student procrastination or reluctance to watch, and encouragement of superficial learning of lecture material.[11]

By providing video recordings, not only are we providing a potential lecture substitute, but students may also perceive that rewatching videos is an appropriate way to study. Ness et al[15] found that audio content played back at double speed led to poorer performance on a multiple-choice posttest. The impact of lecture capture on student performance is unclear. Some studies show improved grade performance when video lectures are available,[16,17] but studies quantitatively assessing video use are either neutral or indicate a negative impact.[14,18–22] In an undergraduate population, failure rates increased in physiology courses upon introduction of lecture capture videos, although attendance and study habits of the population are unclear.[14] There were no significant differences in long-term test scores in doctor of pharmacy students who studied by either rewatching videos or retrieval practice, although students perceived rewatching as a significantly more effective method of studying.[18] Some evidence suggests that poorer performing students may be disproportionately harmed by the availability of lecture capture videos.[14,23]

After the return to classroom instruction, some elements of online teaching carried over, such as continued lecture recordings. Palmer College of Chiropractic required basic science courses to continue to produce video recordings, as either a full lecture capture or a shorter summary video to be given as supplementary materials for in-person course. Twelve out of 14 basic science faculty produced lecture capture videos, while 2 made shorter summary videos. None of the videos contained interactive elements, they were not integrated into course materials, and no clear expectation of use was presented to students. The faculty expressed concern with attendance being poor and suggested that the lecture recordings were adding to this problem. This presented an opportunity for the authors to reflect on whether the recorded resources provided during the pandemic are still necessary. By providing recorded lectures, this allows students the flexibility and autonomy to determine where, when, and how they study.[15,24] However, does this flexibility and autonomy also encourage lower lecture attendance and develop poor study habits? The purpose of this study was to assess the extent and purpose of video usage, perceived benefits, and impact of video use on course performance within first-year basic science courses in an accredited chiropractic curriculum.

METHODS

Participants

All first-year students enrolled in basic science courses at the Davenport, Iowa, campus of Palmer College of Chiropractic during the summer trimester of 2022 were invited to participate. No inducement was offered and students participated voluntarily. Exemption was granted from the Palmer College of Chiropractic institutional review board (X2022-007). During the first 2 weeks of the trimester, a paper survey was administered in a course in second, third, and fourth trimester assessing video usage from courses completed the previous term. Courses in which the survey was administered were chosen based on historical attendance above 70%.

Informed consent was obtained prior to paper survey distribution. A verbal description of the project was given, and written consent was obtained. By agreeing to participate, students also granted the researchers access to the prior-term final course grades and exam scores in which they were enrolled.

Instrumentation

A survey was developed to explore student use of video lecture recording in basic science courses. The survey consisted of 9 questions assessing classroom attendance, video use frequency, reason for use, and perception of utility. All questions were presented in a matrix listing courses to evaluate and 4- or 5-point Likert scales. The number of basic science courses assessed included 6 for first trimester, 5 for second trimester, and 7 for third trimester. Students on special schedules were given space to fill in other courses completed the previous term that were not included in the matrix.

Video use, including both lecture capture and summaries, was addressed using 3 questions. The first used a 4-point Likert scale to rank overall video use including "not at all," "very little," "some," and "a lot." The second assessed the number of videos watched over the trimester per course and the third looked at average weekly time spent viewing recordings from "< 30 minutes," "30–60 minutes," "60–90 minutes," "90–120 minutes," and ">120 minutes." Student attendance was reported using a 5-point Likert scale ranging from "nearly always" to "hardly ever." A separate question asked how many times students opted to watch the videos instead of face-to-face lectures for each individual course over the trimester.

Other questions addressed student use characteristics, such as reasons for video use, where the videos were viewed, and with whom. The survey also contained 3 open-ended questions addressing reasons for using or not using the provided recordings. Finally, 4 demographic questions were included. The survey was pretested on content experts and student volunteers to assess timing and question clarity.

A list of consenting students was provided to the Center for Teaching and Learning, which gathered exam scores and overall course grades for each class in which they were enrolled in the previous term. Survey responses were matched with each student's grades, deidentified, and provided for statistical analysis by another team member.

Data Analysis

Survey data was entered into SPSS version 28.0 (IBM Corp) and Microsoft Excel (Microsoft Corp). Data were summarized using descriptive statistics. For each of the 18 individual courses, independent t tests were used to compare grade performance of students who utilized video recordings vs those who did not use the videos to address the first research question. Statistical significance was set at $p < .05$. For classes

Table 1 - Provided Demographics of Students Completing Video Use Survey and Consenting to Course Grade Access

	Students Assessed in Trimester 2 (n = 70)	Students Assessed in Trimester 3 (n = 101)	Students Assessed in Trimester 4 (n = 89)
Mean age (SD)	24.0 (3.1)	23.9 (3.1)	24.7 (4.1)
Sex			
Male	28	51	42
Female	42	50	43
Ethnicity			
White	56	79	75
African American	3	3	1
Latino or Hispanic	4	7	5
Asian	3	3	1
Native American	1	1	0
Mixed heritage	2	2	3
Prior Education			
Some college	14	20	17
Associate's degree	5	3	3
Bachelor's degree	46	77	63
Master's degree or higher	3	1	4

reaching statistical significance, Cohen's *d* was calculated to determine effect sizes. Interpretation of Cohen's *d* utilized 0.20, 0.50, and 0.80 as indicative of small, medium, and large effect sizes, respectively.[25,26] Open-ended questions were evaluated using an inductive approach to thematic analysis.

RESULTS

Student Population

Three trimesters of courses constituting 260 students completed the questionnaire, yielding a total of 1355 student data points over the 18 courses assessed. The combined cohort was 52% female with an average age of 24.2 years, 83% were Caucasian, and 75% hold a bachelor's degree or higher. Demographic data was similar between all 3 cohorts assessed, as seen in Table 1. Enrollment data and response rates for each individual course are found in Tables 2–4. Response rates ranged from 72% for students enrolled in Neuroanatomy I to 99% in Organ Histology.

Impact of Video Use on Course Performance

Any video use was found to negatively impact exam scores and overall course performance (Tables 2–4). Out of the 18 courses assessed, only 5 were found to be statistically significant. In trimester 1: Neuroanatomy I ($p = .010$); trimester 2: Gross Anatomy II ($p = .007$); and trimester 3: Neuroanatomy II ($p = .020$), Organ Histology ($p = .003$), and Endocrinology ($p = .001$) were found to have significantly lower exam averages and overall course grades in students who reported using course videos. In these classes, video users scored on average 6.2% lower on exams and final grades were 5.5% lower in significant courses. All statistically significant courses posted full lecture recordings on the learning management system (LMS). Conversely, video users in Biochemistry I scored nearly 10% higher on exams, although results were not statistically significant.

Effect sizes using Cohen's *d* were calculated for all statistically significant courses (Table 5). Moderate effect sizes were observed for video use on exam and overall course performance for all classes, apart from exam grades in Endocrinology, which showed a large effect size ($d = 0.806$). Overall, use of videos caused a moderate to large effect on decreased student performance.

Lecture Attendance and Use Characteristics

Overall, 68.8% of students reported attending lectures "nearly always," although reported attendance did decrease as students progressed through the curriculum. Overall, "nearly always attended" lecture was chosen by 82.4% of first trimester students, 55.7% of second trimester students, and 42.3% of third trimester students. Similarly, the number of students using video recordings to replace lecture increased from 21.9% in first trimester to 53.2% in third trimester. Collectively, 11.4% of students reported using videos to replace more than 20 lectures the previous term. This trend seemed to be most prominent for second trimester students.

Students rated their time spent watching videos per course as minutes per week averaged over the term. Most students (62.0%) reported using videos < 30 minutes each week, while a minor student population (8.4%) watched at least 90 minutes of videos each week. More time spent watching videos was associated with decreased classroom attendance. Most (75.0%) students watched videos at home alone, while < 5% reported watching with others.

Student ratings of course recordings as either "somewhat" or "extremely helpful" differed by trimester, as shown by 50.8% of first trimester, 61.6% of second trimester, and 45.2% of third trimester students responses. The perceived helpfulness of videos was associated with heavier usage, primarily to study for exams. Less than 6% of students noted using video recordings to prepare for lecture, while 42.4% utilized video recordings for exam preparation.

Shorter summary videos were preferred by 73.7% of students over full lecture recordings. Only 4 of the 18 courses produced summary videos during the assessment period. Students rated courses providing summary videos higher in

Table 2 - Impact of Video Use on Grades for First-Trimester Courses

Trimester 1 Course	Enrollment Data (n)		Video Usage (n)		Exam Average Mean (SD)	Final Grade Mean (SD)
Neuroanatomy I	Students Assessed	59	No use	21	77.9 (11.0)	85.6 (8.7)
	Students Enrolled	82	Use	38	69.0 (13.2)	78.6 (10.2)
	Response Rate (%)	72.0	*p* value	-	.011	.010
Embryology	Students Assessed	57	No use	29	78.5 (7.9)	82.8 (6.9)
	Students Enrolled	76	Use	28	77.9 (10.0)	81.3 (11.6)
	Response Rate (%)	75.0	*p* value	-	.796	.545
Physiology I	Students Assessed	58	No use	34	80.4 (8.6)	82.2 (8.3)
	Students Enrolled	78	Use	24	77.3 (9.2)	79.2 (9.1)
	Response Rate (%)	74.4	*p* value	-	.184	.186
Gross Anatomy I	Students Assessed	58	No use	16	74.8 (15.8)	81.3 (15.1)
	Students Enrolled	82	Use	42	71.9 (14.1)	79.9 (12.8)
	Response Rate (%)	70.7	*p* value	-	.508	.736
Biochemistry I	Students Assessed	65	No use	3	66.9 (23.0)	70.5 (25.0)
	Students Enrolled	84	Use	62	75.4 (9.8)	81.5 (9.2)
	Response Rate (%)	78.6	*p* value	-	.589	.525
Cell Physiology	Students Assessed	55	No use	34	82.3 (9.2)	86.8 (7.5)
	Students Enrolled	70	Use	21	80.3 (9.9)	84.6 (10.0)
	Response Rate (%)	74.6	*p* value	-	.463	.354

perceived helpfulness. For example, 86.1% of Biochemistry I students rated course summary videos as "somewhat" or "extremely helpful." Open-ended responses stated that students preferred shorter videos because they are "*easier to watch, less time, [and] more helpful*" (Student 3-22), "*I didn't get lost in the details and they were quick and easy to watch*" (Student 2-41), and it makes it "*easier to pay attention*" (Student 4-55).

Qualitative Data

Open-ended questions assessed student beliefs about video helpfulness. Several themes surfaced that were similar for first and second trimester students. Students identified being able to use video recordings for review or study purposes as their major use. Other common themes identified included being able to control the speed of recording, use of parts of videos to filling gaps or missing information from notes, being able to hear the material again, and identify important concepts or instructor emphasis.

Compared to students in earlier trimesters, many more third trimester students identified being able to fill in missing information or gaps and the ability to use video recordings to replace lecture. Several students used the example of feeling more comfortable not attending class to study for exams in other courses, knowing they could use the videos to catch up.

Students not using the video recordings were asked to expand on their reasoning for lack of use. The most common reason for all trimesters was that students already attended lectures and did not feel the need to listen to the same material again. For example, student 4-16 stated "*I attended all classes, and the material covered in class was more than sufficient*

Table 3 - Impact of Video Use on Grades for Second Trimester Courses

Trimester 2 Course	Enrollment Data (n)		Video Usage (n)		Exam Average Mean (SD)	Final Grade Mean (SD)
Spinal Anatomy	Students assessed	86	No use	25	75.7 (8.1)	83.3 (6.1)
	Students enrolled	103	Use	61	74.2 (11.2)	81.8 (8.2)
	Response rate (%)	83.5	*p* value	-	.556	.429
Biochemistry II	Students assessed	86	No use	28	81.4 (9.1)	87.1 (7.5)
	Students enrolled	105	Use	58	79.4 (9.6)	84.8 (8.1)
	Response rate (%)	81.9	*p* value	-	.361	.196
Physiology II	Students assessed	87	No use	24	84.9 (7.9)	89.0 (5.9)
	Students enrolled	100	Use	63	84.8 (7.6)	89.2 (5.8)
	Response rate (%)	87.0	*p* value	-	.940	.887
Gross Anatomy II	Students assessed	93	No use	21	84.4 (8.7)	88.6 (7.0)
	Students enrolled	111	Use	71	77.4 (11.5)	82.8 (8.9)
	Response rate (%)	83.8	*p* value	-	.012	.007*
General Pathology	Students assessed	88	No use	18	84.4 (7.4)	87.9 (5.9)
	Students enrolled	109	Use	78	84.3 (7.5)	87.8 (5.8)
	Response rate (%)	80.3	*p* value	-	.972	.976

*Statistically significant $p < .05$.

Table 4 - Impact of Video Use on Grades for Third Trimester Courses

Trimester 3 Course	Enrollment Data (n)		Video Usage (n)		Exam Average Mean (SD)	Final Grade Mean (SD)
Neuroanatomy II	Students assessed	79	No use	34	83.1 (8.0)	87.2 (7.3)
	Students enrolled	99	Use	43	78.7 (8.2)	83.2 (7.4)
	Response rate (%)	79.8	*p* value	-	.020	.020*
Immunology	Students assessed	82	No use	47	82.2 (7.9)	86.9 (6.6)
	Students enrolled	90	Use	32	79.8 (9.6)	84.8 (7.3)
	Response rate (%)	91.1	*p* value	-	.228	.187
Organ Histology	Students assessed	89	No use	40	86.5 (7.5)	90.8 (6.5)
	Students enrolled	90	Use	48	81.5 (8.7)	86.0 (7.9)
	Response rate (%)	98.9	*p* value	-	.005	.003*
Endocrinology	Students assessed	83	No use	50	88.9 (6.9)	93.1 (6.1)
	Students enrolled	93	Use	33	82.3 (10.0)	87.6 (8.1)
	Response rate (%)	89.2	*p* value	-	.002	.001*
Systems Pathology I	Students assessed	81	No use	37	87.4 (6.3)	89.4 (5.3)
	Students enrolled	86	Use	44	85.5 (7.4)	88.1 (6.0)
	Response rate (%)	94.2	*p* value	-	.229	.298
Physiology III	Students assessed	82	No use	49	91.3 (8.6)	92.1 (6.7)
	Students enrolled	90	Use	33	88.6 (9.3)	90.9 (7.0)
	Response rate (%)	91.1	*p* value	-	.173	.426
Microbiology	Students assessed	79	No use	30	89.4 (8.9)	85.8 (24.2)
	Students enrolled	93	Use	49	90.1 (6.3)	92.3 (5.1)
	Response rate (%)	84.9	*p* value	-	.713	.156

*Statistically significant $p < .05$.

to do well in the classes. Professors taught classes in ways that furthered my understanding. I would list going to class as the #1 reason I did so well in my classes." The lack of clear, consistent guidelines in video production and dissemination led to decreased use. Students explained that some faculty members did not post recordings regularly, they were difficult to find on the LMS, or the inability to control playback speed was a deterrent for use.

DISCUSSION

By supplying videos, a potentially useful resource is provided. However, students may be utilizing videos as a substitute for classroom attendance. In this study, student-reported classroom attendance decreased as they progressed through the first year. Similar trends were seen in undergraduate populations, where attendance decreased and video use increased further along in the program, especially in health science courses.[27,28] Factors influencing live lecture attendance include the perceived educational value of the lecture, timing of the class, and qualities of the lecturer.[6,29,30] Perhaps now is the time to reimagine the educational experience students are currently getting and determine a better way to improve student engagement and the perceived value of the live lecture.

Students may be relying on the recordings due to inappropriate time management or lack of study skills. Taking notes verbatim from the recording is often viewed as effective studying and is perceived by students as one of the best means to improve learning, contrary to exam scores.[31,32] Memorizing information is still interpreted by students as actual learning.[32] Upon exam review, students often express that exam performance did not reflect their perceived knowledge or the amount of time spent preparing. Similarly, Schnee et al[19] found that students who attend class and rewatch full-lecture recordings scored significantly lower on exams. Lecture videos are commonly used as a study tool to prepare for exams.[30,33] In the current study, students reported mainly utilizing videos as a study tool right before a test or quiz. Rewatching videos, especially those verbatim to what was already heard, is often mistaken as learning or time spent studying. Palmer et al[18] assessed students assigned to a "rewatch" group compared to an "immediate retrieval" group. Retrieval of information through quizzing immediately after learning the material significantly enhanced student learning, while rewatching lecture videos and not being quizzed over the information significantly impaired student learning and course performance. Palmer et al[18] also found

Table 5 - Effect Size Calculations for Statistically Significant Basic Science Courses

Trimester	Course	Exam Average Cohen's *d* (95% CI)	Final Grade Cohen's *d* (95% CI)
1	Neuroanatomy I	0.715 (0.164–1.261)	0.720 (0.166–1.266)
2	Gross Anatomy II	0.638 (0.141–1.132)	0.685 (0.186–1.180)
3	Neuroanatomy II	0.545 (0.085–1.001)	0.545 (0.085–1.001)
	Organ Histology	0.615 (0.184–1.043)	0.659 (0.226–1.088)
	Endocrinology	0.806 (0.347–1.261)	0.794 (0.336–1.248)

that students assigned to rewatch videos spent triple the time studying compared to the retrieval practice group. Therefore, rewatching lecture capture videos as a study tool is neither as effective nor efficient as other learning strategies. By providing students with recordings, greater value may be placed on them, creating a false sense of studying, and an illusion of mastery of course material. Studies are needed to determine if explicit instructions on proper video use alters student habits and influences course performance.

Mental health of students has been a longstanding concern for institutions of higher education, which was exacerbated by the pandemic.[34] Student focus groups conducted by Dommett et al[35] suggested use of recorded videos could be used by students who have anxiety about large lecture learning, while others have found that the use of video capture may help students with language barriers and support students with learning disabilities.[36–38] Lecture video availability may provide a greater sense of autonomy for the student. In this study, many student comments expressed the benefit of having the lecture capture videos available as a backup in case they were needed. Furthermore, controlling the pace or speed of the lecture was one of the main reasons students opted to use video recordings if that feature was available. Controlling the speed of the video allows students to control their cognitive load.[27] By asserting some control over the amount of material consumed and the pace at which it is disbursed, student self-efficacy may improve. However, the current video tool utilized by the college does not allow for either speed control or closed captioning.

It is important to point out that most studies assessing use of video recordings and student study skills occurred prior to the pandemic. This may not be an accurate representation of the student population currently enrolled in higher education. Students assessed in this research project were either in their final year of high school or undergraduate program during the height of the pandemic. These are formative years for students to develop study skills and learning strategies. As educators, we may need to spend time helping postpandemic students develop the skills they are lacking, especially when it comes to appropriate use of video recordings.[39,40] Nordmann et al[31] developed a best practice guide for video use, which includes: attend lecture regularly, use recordings to revisit pieces of information not understood, always paraphrase video material, wait 2–3 days to rewatch videos, only watch full recordings to catch up on missed lectures, watched missed videos within 1 week and at normal speed, and always be willing to ask for help or clarification from peers or the instructor.

In the current study, video use in Biochemistry I was associated with a nonsignificant increase in test scores by nearly 10%. This was the only course to provide summary videos uploaded to YouTube and linked to the LMS, allowing students to utilize closed captioning and playback speed control. Further exploration determined that Biochemistry I provided not only summary videos, but also several review videos used for studying that were heavily utilized by students. The 3 students who did not use videos had a very large grade distribution, leading to the lack of statistical significance. The high usage rates in Biochemistry I may be due to providing short summary videos with access to speed control and closed captioning, offering students a greater feeling of control over their cognitive load. As faculty members, we need to be cognizant of the extraneous load we are contributing by providing videos with unclear instruction, lengthy videos, and inconsistent language.[41] The college may consider developing a policy encompassing best practices for video production and dissemination to better meet the students' needs and reassess the capabilities of the available video tools.

Limitations

The unvalidated survey was given to a convenience sample of students during the Summer 2022 trimester (August 2022) about their Spring 2022 basic science courses. Students were asked to recall items, such as attendance habits, use of the recorded resources, and preferences during that trimester; however, students may have found it challenging to remember the information accurately in retrospect. Currently, students may view the videos on the LMS where the videos are posted or an additional app. Neither the LMS nor the app track student usage data; therefore, student reported use is the best available evidence. There also may have been some underrepresentation of students who were repeating courses. Students repeating courses were separately invited to participate in the survey, but very few responses were collected. Additionally, the level of student engagement when present in class was not measured, which may have impacted results.

CONCLUSION

Shorter summary videos were widely preferred by students, but only provided by a few faculty members. Postpandemic students who perceived the videos as being more helpful were more likely to use them, primarily to study for exams. Students who used video recordings for exam preparation had lower exam scores and worse course performance in basic science classes. Rewatching video recordings should not be encouraged as a study tool without additional skills training for students.

ACKNOWLEDGMENTS

We would like to thank Ms. Jody Graham and Mrs. Jennifer Hansen for their help compiling student academic information and Dr. Dustin Derby for his statistical assistance.

FUNDING AND CONFLICTS OF INTEREST

This work was funded internally. The authors have no conflicts of interest to declare relevant to this work.

About the Authors

Lia Nightingale (corresponding author) is a professor in the Division of Life Sciences and Foundations at Palmer College of Chiropractic (1000 Brady St, Davenport, IA 52803; Lia.nightingale@palmer.edu). Amberly Ferguson is an assistant professor in the Division of Life Sciences and Foundations at Palmer College of Chiropractic (1000 Brady St, Davenport, IA 52803; Amberly.ferguson@palmer.edu).

This article was received May 31, 2023; revised October 13, 2023; and accepted December 23, 2023.

Author Contributions

Concept development: AF, LN. Design: AF, LN. Supervision: AF, LN. Data collection/processing: AF, LN. Analysis/interpretation: LN. Literature search: AF, LN. Writing: AF, LN. Critical review: AF, LN.

REFERENCES

1. Thomas MSC, Rogers C. Education, the science of learning, and the COVID-19 crisis. *Prospects (Paris)*. 2020;49(1–2):87–90. doi:10.1007/s11125-020-09468-z
2. Bruggeman B, Garone A, Struyven K, Pynoo B, Tondeur J. Exploring university teachers' online education during COVID-19: tensions between enthusiasm and stress. *Comput Educ*. 2022;3:100095. doi:10.1016/j.caeo.2022.100095
3. Credé M, Roch SG, Kieszczynka UM. Class attendance in college: a meta-analytic review of the relationship of class attendance with grades and student characteristics. *Rev Educ Res*. 2010;80(2):272–295. doi:10.3102/0034654310362998
4. Wongtrakul W, Dangprapai Y. Effects of live lecture attendance on the academic achievement of preclinical medical students. *Med Sci Educ*. 2020;30(4):1523–1530. doi:10.1007/s40670-020-01068-y
5. Kassarnig V, Bjerre-Nielsen A, Mones E, Lehmann S, Lassen DD. Class attendance, peer similarity, and academic performance in a large field study. *PLoS One*. 2017;12(11):e0187078. doi:10.1371/journal.pone.0187078
6. Billings-Gagliardi S, Mazor KM. Student decisions about lecture attendance: do electronic course materials matter? *Acad Med*. 2007;82(10 Suppl.):73–76. doi:10.1097/ACM.0b013e31813e651e
7. Vlachopoulos P, Shazia J. Student attendance, preference and motivation. *J Univ Teach Learn Pract*. 2020;17(5):15. doi:10.53761/1.17.5.15
8. Campbell AM, Ikonne US, Whelihan KE, Lewis JH. Faculty perspectives on student attendance in undergraduate medical education. *Adv Med Educ Pract*. 2019;10:759–768. doi:10.2147/AMEP.S208960
9. Emahiser J, Nguyen J, Vanier C, Sadik A. Study of live lecture attendance, student perceptions and expectations. *Med Sci Educ*. 2021;31(2):697–707. doi:10.1007/s40670-021-01236-8
10. Williams T. University class attendance plummets post-Covid. Times Higher Education. Published 2022. https://www.timeshighereducation.com/news/class-attendance-plummets-post-covid
11. Banerjee S. To capture the research landscape of lecture capture in university education. *Comput Educ*. 2020;160(January):104032. doi:10.1016/j.compedu.2020.104032
12. Edwards MR, Clinton ME. A study exploring the impact of lecture capture availability and lecture capture usage on student attendance and attainment. *High Educ*. 2019;77(3):403–421. doi:10.1007/s10734-018-0275-9
13. Kortemeyer G, Dittmann-Domenichini N, Schlienger C, Spilling E, Yaroshchuk A, Dissertori G. Attending lectures in person, hybrid or online—how do students choose, and what about the outcome? *Intl J Educ Technol High Educ*. 2023;20(1):19. doi:10.1186/s41239-023-00387-5
14. Baillie LD, Banow R, Botterill JJ. The impact of lecture capture availability on academic performance in a large biomedical science course. *Educ Inf Technol*. 2022;27(5):7183–7203. doi:10.1007/s10639-022-10903-1
15. Ness I, Opdal K, Sandnes FE. On the convenience of speeding up lecture recordings: increased playback speed reduces learning. *Lect Notes Comput Sci*. 2021;13117:461–469. doi:10.1007/978-3-030-91540-7_47
16. Bollmeier SG, Wenger PJ, Forinash AB. Impact of online lecture-capture on student outcomes in a therapeutics course. *Am J Pharm Educ*. 2010;74(7):1–6. doi:10.5688/aj7407127
17. Sloan TW, Lewis DA. Lecture capture technology and student performance in an operations management course. *Decis Sci J Innov Educ*. 2014;12:339–355. doi:10.1111/dsji.12041
18. Palmer S, Chu Y, Persky AM. Comparison of rewatching class recordings versus retrieval practice as post-lecture learning strategies. *Am J Pharm Educ*. 2019;83(9):1958–1965. doi:10.5688/ajpe7217
19. Schnee D, Ward T, Philips E, et al. Effect of live attendance and video capture viewing on student examination performance. *Am J Pharm Educ*. 2019;83(6):1200–1206. doi:10.5688/ajpe6897
20. McNulty JA, Hoyt A, Gruener G, et al. An analysis of lecture video utilization in undergraduate medical education: associations with performance in the courses. *BMC Med Educ*. 2009;9(1):6. doi:10.1186/1472-6920-9-6
21. Zipay NM, Roecker CB, Derby DC, Nightingale LM. The influence of online review videos on gross anatomy course performance among doctor of chiropractic students. *J Chiropr Educ*. 2020;34(2):147–155. doi:10.7899/JCE-18-29
22. Shaw KM, Rabatsky A. Use of videos to teach basic science concepts in a doctor of chiropractic training program. *J Chiropr Educ*. 2021;35(2):205-208. doi:10.7899/JCE-17-17
23. Nordmann E, Calder C, Bishop P, Irwin A, Comber D. Turn up, tune in, don't drop out: the relationship between lecture attendance, use of lecture recordings, and achievement at different levels of study. *High Educ*. 2019;77(6):1065–1084. doi:10.1007/s10734-018-0320-8
24. O'Callaghan F V., Neumann DL, Jones L, Creed PA. The use of lecture recordings in higher education: a review of institutional, student, and lecturer issues. *Educ Inf Technol*. 2017;22(1):399–415. doi:10.1007/s10639-015-9451-z
25. Cohen J. A Power Primer. *Psychol Bull*. 1992;112(July):155–159. doi:10.1037//0033-2909.112.1.155
26. Brydges CR. Effect size guidelines, sample size calculations, and statistical power in gerontology. *Innov Aging*. 2019;3(4):1–8. doi:10.1093/geroni/igz036
27. Caglayan E, Ustunluoglu E. A study exploring students' usage patterns and adoption of lecture capture. *Technol Knowl Learn*. 2021;26(1):13–30. doi:10.1007/s10758-020-09435-9
28. O'Brien M, Verma R. How do first year students utilize different lecture resources? *High Educ*. 2019;77(1):155–172. doi:doi.org/10.1007/s10734-018-0250-5
29. Copley J. Audio and video podcasts of lectures for campus-based students: production and evaluation of student use. *Innov Educ Teach Int*. 2007;44(4):387–399. doi:doi.org/10.1080/14703290701602805
30. Brady M, Wong R, Newton G. Characterization of catch-up behavior: accession of lecture capture videos following student absenteeism. *Educ Sci*. 2013;3(3):344–358. doi:10.3390/educsci3030344
31. Nordmann E, Küepper-Tetzel CE, Robson L, Phillipson S, Lipan GI, McGeorge P. Lecture capture: practical recommendations for students and instructors. *Scholarsh Teach Learn Psychol*. 2022;8(3):174–193. doi:10.1037/stl0000190

32. Voelkel S, Bates A, Gleave T, et al. Lecture capture affects student learning behaviour. *FEBS Open Bio*. 2023;13(2):217–232. doi:10.1002/2211-5463.13548
33. Saunders FC, Hutt I. Enhancing large-class teaching: a systematic comparison of rich-media materials. *High Educ Res Dev*. 2015; 34(6):1233–1250. doi:10.1080/07294360.2014.911261
34. Liverpool S, Moinuddin M, Aithal S, et al. Mental health and wellbeing of further and higher education students returning to face-to-face learning after Covid-19 restrictions. *PLoS One*. 2023; 18(1):e0280689. doi:10.1371/journal.pone.0280689
35. Dommett EJ, Gardner B, van Tilburg W. Staff and student views of lecture capture: a qualitative study. *Int J Educ Technol High Educ*. 2019;16(1):23. doi:10.1186/s41239-019-0153-2
36. Nightingale KP, Anderson V, Onens S, Fazil Q, Davies H. Developing the inclusive curriculum: is supplementary lecture recording an effective approach in supporting students with specific learning difficulties (SpLDs)? *Comput Educ*. 2019;130:13–25. doi:10.1016/J.COMPEDU.2018.11.006
37. Morris NP, Swinnerton B, Coop T. Lecture recordings to support learning: a contested space between students and teachers. *Comput Educ*. 2019;140:103604. doi:10.1016/J.COMPEDU.2019.103604
38. James A, Draffan EA, Wald M. Learning through videos: are disabled students using good note-taking strategies? *Lect Notes Comput Sci*. 2016;9758:461–467. doi:10.1007/978-3-319-41264-1_63
39. Peker Ünal D. Factors affecting study habits in higher education during the Covid-19 pandemic. *Anatol J Educ*. 2021; 6(2):109–124. doi:10.29333/aje.2021.629a
40. Jereb E, Jerebic J, Urh M. Studying habits in higher education before and after the outbreak of the COVID-19 pandemic. *Athens J Educ*. 2023;10(1):67–84. doi:10.30958/aje.10-1-4
41. Costley J, Fanguy M, Lange C, Baldwin M. The effects of video lecture viewing strategies on cognitive load. *J Comput High Educ*. 2021;33(1):19–38. doi:10.1007/s12528-020-09254-y