INCREASING ONLINE ATTENDANCE USING INSIGNIFICANTLY IMPACTFUL EXTRA CREDIT AS POSITIVE REINFORCEMENT

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ABSTRACT

The purpose of this research was to investigate if the addition of extra credit affected the overall rate of attendance to synchronous lectures in an online asynchronous course, compared to courses in which no extra credit was offered. Further I investigated if the amount of extra credit made a difference to the rate of attendance. I collected data from 10 courses and found that offering low levels of extra credit led to more students attending lectures. This could lead to students having better interactions with peers and instructors, enjoying their classes more, and/or achieving better academic results.

Keywords: *higher education, online learning, applied behavior analysis, extra credit, synchronous courses, asynchronous courses, attendance*

INTRODUCTION

Switching to an online teaching format may result in a loss of student-to-instructor connections compared to a traditional face-to-face course. Joyner et al. (2014) found that active participation in online courses by both the student and the instructor led to better student learning outcomes. Live lectures, through relatively simple synchronous virtual classrooms, are one way to foster active participation in an online learning environment (Martin & Parker, 2014; Martin & Ritzhaupt, 2023; Sharifrazi &Stone, 2019).

I found many positive aspects to online learning environments in my own education, and wanted to ensure my students were offered similar opportunities for academic achievement. Soon after beginning my online teaching career, however, I noticed dwindling attendance to the lectures. My supervisors were adamant that due to the program's structure, and the time constraints of adult learners, lecture attendance could not be required. This led to several late nights crafting what I thought to be exciting, new, or creative lectures to pique the students' interest; reading up on the latest trends in how to use Blackboard features to get more online engagement; and brainstorming other ideas to get adults to *choose* to join in synchronously—without strictly requiring them to.

This paper will outline some of the literature I found while studying online learning and engagement. Next, I briefly describe some studies that draw upon behavioral theories—which was the topic taught in the courses of focus—before proposing the two research questions that guided the research design. After that I explain the methodology, including the study's sample, data, materials, design, and procedure. Then, I describe the results and present several tables of data and statistics. Lastly, I discuss the findings and how they relate to existing literature as well as their implications for the online teaching environment.

LITERATURE REVIEW

The literature search began with what I was most confident and comfortable in studying: applied behavior analysis. It was what I did in my regular job, and it was what I was teaching at the time. It made sense to start with what I knew. I asked an easy first question: How is positive reinforcement being used in adult education? In a

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recent study, students were introduced to a series of scaffolded, game-based opportunities that were tracked on a leaderboard (Welch, 2021). These accumulated points could be turned in for points, for access to closed assignments they could redo later in the course, and so on. In their study of strategies to promote success in an online classroom, Hamilton (2016) noted that faculty find the use of positive reinforcement to be essential when working with students. Similarly, Wilder et al. (2001) studied the use of extra credit quizzes and found that it increased attendance by 10%. These were important findings, but something more was needed since these studies referenced in-person courses (Wilder et al., 2001) or synchronous online courses (Welch, 2021; Hamilton, 2016).

I needed to focus more on the differences between synchronous and asynchronous learning environments. Several studies examined synchronous virtual classrooms in an asynchronous learning environment. Nieuwouldt (2020) found that attending synchronous lectures online led to significantly higher grades than those who did not attend those same lectures. Martin and Parker (2014) found that students viewed synchronous lectures as a way to increase the quality of interactions between themselves and their peers as well as themselves and their instructor. Martin and Borup (2022) further suggested that students found these interactions to be valuable, but it depended much on how the instructor organized the time spent together. Lastly, while Goode et al. (2022) did not find improved overall outcome scores for those who attended the synchronous sessions, the students described how they felt a stronger sense of community and learned more during the sessions than those who did not attend. However, even when synchronous sessions are made available to students, not all students may be able to attend. Banna et al. (2015) studied strategies to increase student engagement in an online nutrition course and found that only half of the students were able to attend the first synchronous session, while Gill and Jones (2010) found only 15%–20% of students attended live sessions. Even when students attend live sessions, however, Jones (2022) argued that we cannot be sure that they are actively engaged when cameras are off and microphones are muted.

Beyond the use of quantitative measures, it can be constructive to hear directly from students what works and what does not. For example, Tabak and Rampal (2014) used a qualitative study of synchronous elearning and student reflections about their experiences and found that students enjoyed hearing from other students, found the discussions to be relatable, and found it useful to discuss real-life applications and examples of the course material. Other students generally rated synchronous engagement with instructors higher than asynchronous lectures (Panferov et al., 2020). These benefits, however, did not extend to those unable to attend synchronous sessions. While there are many factors that might cause a lack of attendance (e.g., family, work commitments, health), students suggested that there are ways to increase attendance such as giving in class assignments, requiring attendance as part of their grades, or only providing lecture materials during the live courses (Bukoye, 2023; Bukoye & Shegunshi, 2016).

The strategies outlined above were effective for the students of those studies; however, there were still three major concerns:

1. The program in which I taught did not allow me to implement many of those strategies.
2. Applied behavior analysis views punitive approaches (like removal of points) as ineffective over the long term (Cooper et al., 2019).
3. Many of those studies were generally occurring in synchronous environments, and therefore less applicable to my specific situation.

In my asynchronous courses, wherein attendance could not be made mandatory, many of these strategies could not be used. Instead, I wanted to find a way to encourage students to attend the live, supplemental lectures. Since prior research shows that attendance at synchronous sessions leads to better student participation and outcomes (Goode et al., 2022; Joyner et al., 2014; Martin & Parker, 2014; Nieuwoudt, 2020), and researchers have found that students show up if instructors use positive reinforcement and extra credit opportunities (Hamilton, 2016; Wilder et al., 2001), I sought to combine these efforts to see if they would lead to better student attendance. The aim of this research was to answer the following research questions:

1. Does the use of positive reinforcement by way of extra credit affect the overall rate of student attendance in synchronous online lectures?
2. Does the amount of extra credit result in any statistical difference in overall attendance?

METHOD

Study Sample

I was the sole instructor of various courses across a two-year period. There are 10 courses of comparison in this study. Of the 10 courses, two of the courses were control groups. In one control group, there were no weeks of extra credit given for attending any of the synchronous lectures. The other control group (noted as Class 2 in Table 1) is included in both the control group and in the B group (the group receiving 2 points of extra credit for attendance). This was a test because for the first seven weeks, no extra credit was given. But in the final week of the course, extra credit was offered. In Table 1, Class 2 appears twice (in rows two and three), showing a row with seven data points (Class 2a) and a row with just one (Class 2b). These indicate the weeks without extra credit and the week with extra credit, respectively. The remaining eight courses were split into two experimental groups. (See the Design section below.)

There were a number of students (not identified specifically) that had taken the control group course and then taken later courses that ended up being the experimental conditions. These factors were not considered in the data analysis but are acknowledged as having the potential to impact results. Fortunately, no students that were in the experimental course were in any subsequent experimental courses.

Data Collection

The research I present was based upon data that were collected while teaching in the Applied Behavior Analysis (ABA) graduate program at an online university headquartered in California. All data were gathered in numerical format alone and no participant data was involved in the research. The available courses to teach were emailed to a pool of adjunct professors and were "first come, first served." They rotated courses so that every other class could earn 1 point of extra credit (n = 5), while the other courses would earn 2 points of extra credit (n = 4). In either case, the total possible extra credit never exceeded 5% of the total possible course points. These courses were compared to two previous courses in which no extra credit was provided for attendance (the control groups; n = 2).

Materials

The program utilized Blackboard Learn, which was required and designed through the university's elearning platform. Within Blackboard Learn, the individual synchronous sessions were held using the Blackboard Collaborate system and was later upgraded to the Blackboard Collaborate Ultra system. Research data were analyzed using Microsoft Excel. Content validity was established by comparing collected results to the Blackboard Collaborate and subsequent Blackboard Collaborate Ultra archive to ensure accuracy in count and percentage of students that attended each live session.

Design

The experiment utilized a between-groups design, including two comparison control groups, four groups in Condition A and five groups in Condition B. The comparison groups received no extra credit for attending synchronous sessions. The Condition A group received 1 point of extra credit per session attended. The Condition B group received 2 points of extra credit per session attended. I taught the control groups first to establish a baseline of attendance to compare against future courses. Subsequent courses were taught alternating between Condition B and Condition A. I chose to teach the last course in Condition A (resulting in the following pattern: B, A, B, A, B, A, B, A, A). Future researchers may want to consider rotating the conditions to include the control group so a complete reversal design occurs and a return to baseline is possible, potentially indicating a stronger relationship. Further, if I were to conduct this study again, I would include control groups of both four- and eight-week classes.

Procedure

I took baseline data for two courses. Throughout these courses, I noted the total number of students enrolled and the number of attendees, calculating an average rate of attendance per session and an average per course. The attendance rates in the control groups (outlined in the results section) mirrored the results of previous studies (i.e., Banna, et al., 2015; Gill & Jones, 2010). While this study focused solely on attendance, future researchers may want to also study other outcome measures, such as student achievement outcomes (i.e., grades, satisfaction) as a comparison to those who did not attend synchronous lectures.

Once the baseline was established, I moved on to the experimental portion of the research. I began each course with a description of the extra credit opportunity available for attending any synchronous session. The students were reminded of this opportunity throughout each course, usually the day of or day before the synchronous session was planned. I was careful to choose a number of points that could not significantly improve a student's overall grade (i.e., no more than 5% of total available points across the entire course; either 1 or 2 points per session). I also made it clear that no other forms of extra credit would be made available to students to ensure that attendance was the only variable associated with the additional points.

I taught five courses that offered a single point of extra credit per session attended and four courses that offered 2 points of extra credit per session attended. The courses studied in the research included a combination of four- and eight-week courses and across five different courses (to maintain confidentiality of the university, the course names have been removed). Of these courses, only one included a comparison of both the control and experimental conditions. Three of the courses were taught more than once across the two-year term.

During each synchronous session, I continued to note the total number of students enrolled in the course compared to the total number of students that attended each session (see Table 1). The data were then added to a database in which I calculated the overall percentage of attendance per session compared to the overall number of students enrolled in the course. At the end of the course, I calculated the average level of attendance across all synchronous sessions compared to the total number of students in the course. These averages per course were included in the statistical analysis.

RESULTS

The class distribution is shown in Table 1. This table outlines the number of students that attended each available synchronous lecture. Some weeks only asynchronous lectures were offered—for various reasons—or the course was shorter than others and is noted as such. Each course is shown with the total number of students enrolled and the number of extra credit points offered per lecture attended, if any. In the following subsections, I calculated average attendance rates for the control groups, Condition A groups, and Condition B groups. I calculated statistical significance using a t-test with data collected from courses in which extra credit was not offered for attendance to live lectures and courses in which extra credit was offered to compare "two groups in terms of outcomes" (Creswell & Creswell, 2018, p. 159). Lastly, I ran further

Table 1.

Frequency of Student Attendance per Class

	Number of Attendees Per Week									
Class	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**	**Total Enrolled**	**Extra Credit Points**
1	n/a[a]	3	n/a[a]	6	n/a[a]	10	n/a[a]	2	26	0
2a[b]	13	6	10	3	4	2	n/a[a]	n/a[a]	28	0
2b[b]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	18[b]	28	2
3	11	13	11	13	10	13	9	11	28	1
4	3	7	8	9	n/a[a]	n/a[a]	n/a[a]	n/a[a]	30	2
5	7	8	n/a[a]	8	6	7	7	6	24	1
6	8	9	8	9	n/a[a]	n/a[a]	n/a[a]	n/a[a]	23	2
7	11	5	7	11	n/a[a]	n/a[a]	n/a[a]	n/a[a]	14	1
8	19	12	13	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	25	2
9	14	11	10	11	n/a[a]	n/a[a]	n/a[a]	n/a[a]	30	1
10	12	14	8	13	n/a[a]	n/a[a]	n/a[a]	n/a[a]	33	1

[a] Reflects the lack of a live lecture that week due to (a) illness, (b) class falling on a federal holiday, or (c) the course was a shorter number of weeks (some were four weeks rather than eight).
[b] This was the class that included the extra credit incentive at the end of the course, while the other seven weeks of classes did not include extra credit.

Table 2.
Percentage of Control Group Attendance

	Percentage of Attendees Per Week									
Class	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week7**	**Week8**	**Total Enrolled**	**Average % Attendance**
1	n/a[a]	12%	n/a[a]	23%	n/a[a]	38%	n/a[a]	8%	26	20%
2	46%	21%	36%	11%	14%	7%	n/a[a]	n/a[b]	28	23%

[a] Reflects the lack of a live lecture that week due to (a) illness, (b) class falling on a federal holiday,
(c) the course structure, or (d) the course was a shorter number of weeks (some were four weeks, rather than eight).
[b] This was the class that included the extra credit incentive at the end of the course, while the other seven weeks of classes did not include extra credit.

analyses to determine the statistical differences between the amount of extra credit offered.

Control Group Attendance

The control group attendance is summarized in Table 2. The attendance for Class 1 ranged from 8% to 38%, with an average of 20%. The attendance for Class 2 ranged from 7% to 46%, with an average of 23%. The overall average attendance for all the control groups was 21.5%.

Condition A Group Attendance

The Condition A group attendance is summarized in Table 3. The attendance for Class 3 ranged from 32% to 46%, with an average of 43%. The attendance for Class 5 ranged from 25% to 33%, with an average of 32%. The attendance for Class 7 ranged from 36% to 79%, with an average of 61%. The attendance for Class 9 ranged from 33% to 47%, with an average of 38%. The attendance for Class 10 ranged from 24% to 42%, with an average of 36%. The overall average attendance for all the Condition A groups was 42%.

Condition B Group Attendance

Table 3.
Percentage of Condition A Group Attendance

	Percentage of Attendees Per Week									
Class	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**	**Total Enrolled**	**Average % Attendance**
3	39%	46%	39%	46%	36%	46%	32%	39%	28	43%
5	29%	33%	n/a[a]	33%	25%	29%	25%	25%	24	32%
7	79%	36%	50%	79%	n/a[a]	n/a[a]	n/a[a]	n/a[a]	14	61%
9	47%	37%	33%	37%	n/a[a]	n/a[a]	n/a[a]	n/a[a]	30	38%
10	36%	42%	24%	39%	n/a[a]	n/a[a]	n/a[a]	n/a[a]	33	36%

[a] Reflects the lack of a live lecture that week due to (a) illness, (b) class falling on a federal holiday, or (c) the course was a shorter number of weeks (some were four weeks, rather than eight).

Table 4.
Percentage of Condition B Group Attendance

	Percentage of Attendees Per Week									
Class	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**	**Total Enrolled**	**Average % Attendance**
2	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	64%	28	64%
4	10%	23%	27%	30%	n/a[a]	n/a[a]	n/a[a]	n/a[a]	28	43%
6	35%	39%	35%	39%	n/a[a]	n/a[a]	n/a[a]	n/a[a]	23	37%
8	76%	48%	52%	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	25	59%

[a] Reflects the lack of a live lecture that week due to (a) illness, (b) class falling on a federal holiday, or (c) the course was a shorter number of weeks (some were four weeks, rather than eight).
[b] This was the class that included the extra credit incentive at the end of the course, while the other seven weeks of classes did not include extra credit.

The Condition B attendance is summarized in Table 4. The extra credit day for Class 2—the single day of extra credit, the other days of the course had no extra credit—resulted in 64% attendance. The attendance for Class 4 ranged from 10% to 30%, with an average of 23%. The attendance for Class 6 ranged from 35% to 39%, with an average of 37%. The attendance for Class 8 ranged from 48% to 76%, with an average of 59%. The overall average attendance for all the Condition B groups was 46%.

Extra Credit versus No Extra Credit

I hypothesized that the rate of student attendance for live lectures would increase when extra credit was offered for attending. To measure this, I calculated the average attendance across each lecture that did not include extra credit and average attendance across each lecture that did include extra credit. In the sample (N = 11), attendance increased after the introduction of extra credit from M = 22% to M = 44%. The change was statistically significant, t(9) = −2.09, p = .03 (see Table 5).

Table 5.
t-Test: Two-Sample Assuming Equal Variances

	Without EC	With EC
Mean	0.22	0.44
Variance	0.00	0.02
Observations	2.00	9.00
Pooled Variance	0.02	
Hypothesized Mean Difference	0.00	
df	9.00	
t Stat	-2.09	
P(T<=t) one-tail	0.03	
t Critical one-tail	1.83	

Note. EC refers to Extra Credit.

More Extra Credit versus Less Extra Credit

I also hypothesized that students would be more likely to attend the live lectures when more extra credit was offered. To measure this, I calculated the difference in attendance for lectures wherein there was 1 point of extra credit offered compared to 2 points of extra credit offered. In the sample of extra credit courses (n = 9), M = 42% attendance for 1 point of extra credit and M = 45.75% attendance for 2 points of extra credit. There was no significant statistical difference in attendance based on the number of extra credit points offered, t(7) = −.037, p = .36 (see Table 6).

Table 6.
t-Test: Two-Sample Assuming Equal Variances

	1 pt EC	2 pts EC
Mean	42.00	45.75
Variance	128.50	367.58
Observations	5.00	4.00
Pooled Variance	230.96	
Hypothesized Mean Difference	0.00	
df	7.00	
t Stat	-0.37	
P(*T*<=t) one-tail	0.36	
t Critical one-tail	1.89	

Note. EC refers to Extra Credit

DISCUSSION

The mean rate of attendance in the control conditions mirrored the findings of Gill and Jones (2010), who found that 15%–20% of students attended lectures, while I found an average of 22% of students attended synchronous lectures online. However, those averages increased with the addition of extra credit to 44% of students. This is a much higher improvement than when the instructor offered extra credit quizzes exemplified by Wilder et al. (2001; they found a 10% increase in attendance compared to a 50% increase in the current study).

> Research Question 1: Did the use of positive reinforcement by way of extra credit affect the overall rate of student attendance in synchronous online lectures?

I found that the use of positive reinforcement by way of extra credit positively impacted the overall rate of student attendance in synchronous online lectures compared to courses in which no extra credit was offered. Positive reinforcement was shown to be an effective tool similar to previous studies for bringing students online, even when it was not a requirement for their course (Hamilton, 2016; Welch, 2021; Wilder et al., 2001). It is especially important to reiterate that these lectures were entirely optional as these courses were developed to be taken asynchronously. This can be a useful method for other instructors to use in

both synchronous and asynchronous courses to help motivate students to attend online lectures and discussions.

> Research Question 2: Did the amount of extra credit result in any statistical difference in overall attendance?

There was no statistically significant difference in attendance rates based on the amount of extra credit (1 or 2 points) provided to students that attended. These findings show that students can be motivated to attend synchronous lectures in an asynchronous course, which can improve overall outcomes in their academic achievement (Joyner et al, 2014; Nieuwoudt, 2020), but the amount of the extra credit was less important. This is the key takeaway from this study. The number of points the students earned was less important than the fact that they were earning something by attending the lectures and discussions. By earning that small amount of extra credit, students were that much more motivated to attend, which led them to be that much more likely to attend the next time.

Positive reinforcement is an incredibly useful tool that does not lose its power over time the way that punishment does (Cooper et al., 2019). Any time there is an opportunity to remove punishment and use positive reinforcement in its place, we should. However, it is important to note that this study took place in a series of courses on the topic of applied behavior analysis, using *principles* of applied behavior analysis. These methods need to be used in other courses since students in this field may differ in their tendencies compared to students in other majors. While I do not believe that these students actually behaved any differently than other students would, it is a potential limitation that is necessary to point out.

CONCLUSION

Bringing students together on a larger scale resulted in more frequent opportunities to interact with each other and with the instructor (Martin & Parker, 2014) and build community (Goode et al., 2022), all while likely improving the overall experience of the online course (Panferov et al., 2020; Tabak & Rampal, 2014). Future research could expand further to compare levels of academic achievements between conditions. If instructors of online courses have difficulty motivating their students to attend synchronous lectures, it appears that offering small amounts of extra credit is a highly effective solution without detriment to the overall grading system.

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