International Journal for the Scholarship of Teaching and Learning

Volume 9 | Number 2 Article 4

July 2015

Evaluating Classroom Time through Systematic Analysis and Student Feedback

Rebecca M. Achen
Illinois State University, rmachen@ilstu.edu

Angela Lumpkin
Texas Tech University, angela.lumpkin@ttu.edu

Recommended Citation
Achen, Rebecca M. and Lumpkin, Angela (2015) "Evaluating Classroom Time through Systematic Analysis and Student Feedback," *International Journal for the Scholarship of Teaching and Learning*: Vol. 9: No. 2, Article 4.
Available at: https://doi.org/10.20429/ijsotl.2015.090204

Evaluating Classroom Time through Systematic Analysis and Student Feedback

Abstract

The purpose of this action research was to examine the use of class time through classroom observation and student feedback. Students', the teacher's, and whole class activities during class were categorized every two minutes. Students also were given pre- and post-course surveys to assess perceptions on lecture time, impact of learning strategies, and enjoyment of learning strategies. Results indicated students spent the majority of class time actively engaged in their learning instead of passively listening to lectures. However, their views of the optimal amount of lecture time did not change. Even though students overwhelmingly enjoyed engaging learning activities and found them helpful, they still believed teachers should lecture more than 60% of the time, even though the teacher in this course only lectured 30% of the time. Evaluating the way class time was spent was very useful to the teacher for course assessment and planning.

Keywords

active learning, classroom assessment, student perceptions, student feedback

Evaluating Classroom Time through Systematic Analysis and Student Feedback

Rebecca M. Achen[1] and Angela Lumpkin[2]

[1]Kinesiology and Recreation, Illinois State University, Normal, IL, USA; [2]Sport Management, Texas Tech University, Lubbock, TX, USA

(Received 10 September 2014; accepted 6 May 2015)

The purpose of this action research was to examine the use of class time through classroom observation and student feedback. Students', the teacher's, and whole class activities during class were categorized every two minutes. Students also were given pre- and post-course surveys to assess perceptions on lecture time, impact of learning strategies, and enjoyment of learning strategies. Results indicated students spent the majority of class time actively engaged in their learning instead of passively listening to lectures. However, their views of the optimal amount of lecture time did not change. Even though students overwhelmingly enjoyed engaging learning activities and found them helpful, they still believed teachers should lecture more than 60% of the time, even though the teacher in this course only lectured 30% of the time. Evaluating the way class time was spent was very useful to the teacher for course assessment and planning.

INTRODUCTION

Cognitive science research confirms individuals learn differently, such as through the infusion of alternative teaching strategies interwoven with lectures (Bonwell & Eison, 1991; Burgan, 2006; Michael, 2006). Also, more time-on-task increases greater engagement and learning (Lowerison, Sclater, Schmid, & Abrami, 2006). Finally, students learn more through participation in active learning approaches while enjoying learning more (Barber, 2007; Mohamed, 2008; Wieman, Perkins, & Gilbert, 2010). Despite overwhelming evidence suggesting teachers should consider other teaching strategies, didactic lectures continue to predominant in college classrooms (Barber, 2007; Feden, 2012; Larson & Lovelace, 2013).

The argument that lectures serve an essential role in delivering disciplinary content has merit, but they should not be the only instructional methodology used. While it may be easier to pontificate as a sage on the stage, evidence is overwhelming that most students do not enjoy or learn as much in comparison with engagement through numerous active learning strategies (Bonwell & Eison, 1991; Chickering & Gamson, 1987; Machemer & Crawford, 2007; Michael, 2006; Nunn, 1996).

Assessing the extent of student learning achieved through participation in active learning approaches is not as well documented (Machemer & Crawford, 2007; Millis, 2012). Mohamed (2008) attempted to assess participation by comparing three different types of learning modules in a chemistry class and found students learned more when actively engaged. An Active-Learning Inventory Tool developed by Van Amburgh, Devlin, Kirwin, and Qualters (2007) revealed learning through the use of 22 active learning techniques could be measured in pharmacy classes. Smith, Jones, Gilbert, and Wieman (2013) conceptualized and used a classroom observation protocol to assess teaching quality and resultant student learning in science, technology, engineering, and mathematics (STEM) courses. Such limited research motivated the modification and use of the classroom observation protocol designed for STEM courses to an introductory course by an experienced teacher committed to an extensive use of active learning strategies to facilitate greater student learning.

The teacher in the class described in this action research project began her career primarily lecturing, just as she had been lectured to during her college years. She realized, however, that expecting students to sit and listen for 50, 75, or 150 minutes while maybe (or maybe not) taking notes often led to fidgeting, doodling, drowsiness, and in recent years web surfing or texting. Engaging though she might have been, as students passively listened, many were not interested in or prepared to cognitively engage with the content. Something needed to change!

Extensive reading of books and articles about the scholarship of teaching, active learning strategies, and classroom assessments stimulated a gradual and then a substantive change in her instructional approach to teaching. She was convinced students learned by doing much more effectively than they did by simply listening; or as Knight and Wood (2005) concluded, she believed her classes could become more engaging without sacrificing content. She began by using discussions among pairs, small groups, and the entire class. Written assignments in-class and out-of-class were then added with extensive written feedback on the latter. She added interviews, review questions, checks for understanding, and minute papers. She also infused technology throughout her classes, including videos, well-designed and illustrated PowerPoint slides, Poll Everywhere, group blogs, and Jeopardy review games. Determined to limit lectures to 10-15 minute increments, multiple active learning strategies were incorporated into every class. It became clear that more assessment of this approach was necessary. The purpose of this study was to test a classroom observation protocol in a non-STEM field and evaluate class time usage to better inform teaching and its effectiveness.

REVIEW OF LITERATURE

Chickering and Gamson (1987) conjectured, "Learning is not a spectator sport. Students do not learn much just by sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers" (p. 4). Chickering and Gamson's work remains one of the most widely cited scholarly articulations of the importance of active learning in undergraduate education. Nonetheless, didactic lectures continue to abound in higher education for numerous reasons, such as teachers' beliefs that they are the most effective way to deliver disciplinary content (Barber, 2007; Feden, 2012; Larson & Lovelace, 2013). Lom (2012) suggested lectures were economically effective for large classes, while Burgan (2006) added students benefited by learning from disciplinary experts. Many teachers believed personally and have been told some students preferred lectures (Covell, 2011; Machemer & Crawford, 2007; Welsh, 2012).

Because students were at different stages in their cognitive

https://doi.org/10.20429/ijsotl.2015.090204

and psychosocial development, Burgan (2006) argued lectures were not as effective as active learning, as did Barber (2007), Knight and Wood (2005) and Mohamed (2008). Sponsored by the Office of Educational Research and Improvement, Bonwell and Eison's (1991) groundbreaking monograph with its over 200 references concluded students "have learning styles best served by pedagogical techniques other than lecturing" (p. iii). From students' perspectives, when they viewed an instructional approach positively, they were more motivated to learn (Covell, 2011). Most poignantly, lecturing has been proven to be at odds with human cognitive research regarding how students learn (Michael, 2006).

Increasingly, faculty have been encouraged to more actively engage students (Bonwell & Eison, 1991; Chickering & Gamson, 1987; Mohamed, 2008). As Bain (2004) stated, great teachers engaged their students. Most teachers wanted to connect with their students so they could teach them more effectively (Barber, 2007), while skillful teachers would do whatever helped students learn (Brookfield, 2006). Since "…research suggests that the exclusive use of the lecture in the classroom constrains students' learning" (Bonwell & Eison, 1991, p. 24), and one of the principles of good practice in undergraduate education was the use of active learning techniques (Chickering & Gamson, 1987), college students everywhere could be better served and learn more if a variety of pedagogical approaches were used. Could it be that continued reliance on lecturing might be considered educational malpractice?

Students also have come to expect the infusion of technologies throughout their collegiate learning experiences (Malm & Defranco, 2011-2012). Rather than relying solely on their teachers as disciplinary experts to provide information, students demand instant access to information using Internet search engines. In college classrooms, instructional technologies have become ubiquitous (Lowerison et al., 2006). Classroom response systems, or clickers, (Bachman & Bachman, 2011; DeBourgh, 2008; Sevian & Robinson, 2011), interactive games (Azriel, Erthal, & Starr, 2005; Millis, 2010), video clips (D'Angelo & Woosley, 2007; Wright & Abell, 2011), learning management systems (Malm & Defranco, 2011-2012), online blogs (Cheng & Chau, 2011; Hsu & Wang, 2011), and flipped courses (Baepler, Walker, & Driessen, 2014; Bergmann & Sams, 2014) are a few examples of how students' engagement changed from passive listener to active participant through the infusion of technologies.

Research shows undergraduate students learned more through engaging in active instructional practices than in solely didactic lectures (Bonwell & Eison, 1991; Lom, 2012; Millis, 2012). Smith et al. (2013) reported limited use of active learning approaches in STEM courses, although they realized STEM faculty required data to be convinced of their worth before they would modify instructional approaches from mostly lecturing to inclusion of engaging learning activities (Wieman et al., 2010).

Chasteen, Perkins, Beale, Pollock, and Wieman (2011) advocated transforming courses through an exploration of what students should learn, and how to improve this learning, with an emphasis on the articulation and achievement of student learning outcomes. They suggested using peer instruction, group work, problem-solving, and real-world connections as parts of these transformed courses. Also, they stated faculty needed to understand how students were thinking about course content and what difficulties they were experiencing — what did past research show; what were students saying during discussions or with the questions they were asking; and what did homework assignments and tests reveal about common errors or difficulties. They suggested minute papers and interviews could help them learn what students were thinking about and what their perceptions were.

Some researchers have made an effort to devise methods to evaluate usage of class time and activities. Nunn (1996) developed an observational coding system to measure 16 discussion-related teaching techniques. In an analysis of 20 classes, she found only 2.28% of class time involved student participation. While there was a large variation in the range of time students spent participating, overall, students were observed talking for only 1 out of every 40 minutes of class time. She also reported that as class enrollment increased to more than 35 students, the percentage of time students were actively participating fell markedly. In the classes observed, very little time was devoted to interaction and student participation. She concluded very good teachers "should increase the amount of time spent in interaction and involve more students in order to maximize student learning" (p. 260).

Van Amburgh et al. (2007) developed the Active-Learning Tool to measure 22 active learning techniques, including questions and answers, minute papers, think-pair-share, and peer feedback. In the development of this tool, these authors reported an average of 13 (range of 4-34) episodes of active learning that took an average of 2.2 minutes (range of 0.6-16 minutes) each. A range of 2-5 different types of active learning activities was observed. However, this Active-Learning Tool did not determine the impact of these engaging activities on student learning.

Wieman and Gilbert (2014) argued that existing classroom observation protocols captured only what went on during class plus required hours of training to ensure reliable results. Through the Teaching Practices Inventory (TPI), they sought to develop and validate an inventory that would help teachers "evaluate their teaching, see how it might be improved, and track improvement" (p. 553). The TPI includes eight categories: course information provided (i.e., learning goals or outcomes); supporting materials; in-class features and activities; assignments; feedback and testing; other (i.e., diagnostics, pre- and post-testing, new methods with measures, etc.); training and guidance of teaching assistants; and collaboration or sharing in teaching. Research-based teaching practices were used to inform the development of the scoring rubric in each of the eight categories. They expressed confidence the RPI would become a valuable, quantitative tool for evaluating and improving undergraduate teaching in STEM courses as well as in other disciplines.

Smith et al. (2013) sought to evaluate teaching in STEM classes, give feedback to interested teachers about class time usage by their students and them, and potentially identify areas where professional development might be beneficial. With achievement of these goals in mind, they examined existing observational protocols but rejected them because they required observers to make judgments about how well the teaching conformed to a specific standard, lengthy training was required to achieve inter-rater reliability, or instructional practices were coded but lacked measures of instructional effectiveness. In an attempt to overcome these limitations, they developed the Classroom Observation Protocol for Undergraduate STEM (COPUS) to assess what the instructor was doing and what students were doing.

During an over 2-year iterative process characterized by extensive testing through 5 versions, Smith et al. (2013) developed

COPUS, resulting in 25 instructor and student codes descriptive of what was occurring in class. Using these codes, an observer documented classroom behaviors of the instructor and students every two minutes with an emphasis on the interactions among them during various activities. The COPUS protocol provided an overview of what was happening in classes along with feedback to teachers about how they and their students were spending class time. For example, during the developmental process for COPUS, some teachers were observed lecturing with students listening over 76% of the class time. While use of COPUS did not require judging the quality of instruction, classroom observations using COPUS sought to capture exactly what students and the instructor were doing during class time to help teachers incorporate more active learning strategies that had been shown to enhance student learning.

Another aspect of classroom assessment included asking students perceptions of classes and their learning. Student perceptions were essential as they reveal several important pieces of information. First, when students were more motivated, such as because they perceived the relevance of learning specific information, they worked longer (Lom, 2012). Second, he also reported that when students perceived the teacher's enthusiasm about certain content, they were more likely to show an interest in learning. Third, most students perceived active learning was much more engaging than lecturing (Bonwell & Eison, 1991; Millis, 2012). Fourth, students perceived they learned from interactions with classmates who shared diverse views and ideas (Doyle, 2008). Fifth, students perceived they understood concepts better and made more concrete, real-world applications because they gained confidence through writings and discussions (Lumpkin, Achen, & Dodd, 2015).

In an attempt to connect learning strategies to actual gains in student learning, Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, and Wenderoth (2014) conducted a meta-analysis of 225 studies that examined academic performance rates of students in STEM courses. They reported examination scores improved an average of 6% (approximately one standard deviation) in courses using active learning strategies, while students in lecture-based courses had a 55% higher failure rate. These results called into question the efficacy of continued reliance on lecturing, especially since they concluded "active learning confers disproportionate benefits for STEM students from disadvantaged backgrounds and for female students in male-dominated fields" (p. 8413). They argued persuasively for using advances in cognitive science and constructivist learning to test which types of active learning strategies would result in additional gains in student learning.

The Freeman et al. (2014) results affirmed the importance of learning more about how class time was used and how students perceived the impact of active strategies on their learning. This action research project provides quantitative data about the use of class time in one undergraduate course to document the use of a variety of active learning strategies to provide feedback to the teacher about how she and her students spent class time, and specifically to answer these research questions:

1. How is classroom time being spent by students and the teacher?
2. What are students' attitudes toward the percentage of time spent lecturing?
3. Did students' attitudes toward the level of impact of active learning strategies change from the beginning to the end of the course?
4. Did students' attitudes toward the enjoyment of active learning strategies change from the beginning to the end of the course?
5. Do students' perceptions of how classroom time should be spent match their perceptions of how classroom time was spent?
6. What are the correlations between students' perceptions of the impact and their perceptions of enjoyment of each learning strategy?

METHOD

This action research project was designed to examine use of classroom time in an Introduction to Sport Management course using COPUS (Smith et al., 2013). We were introduced to the protocol during a campus presentation at a teaching summit. The protocol presented during the campus presentation was examined and adapted for this course as the full paper had not yet been published before the pilot coding took place. The full COPUS protocol includes 13 codes for student activity, however, the presentation only listed 6 codes including individual thinking, listening, clicker question discussion, worksheet group work, answer instructor question, and student asks a question. The full protocol has 12 codes for teacher activity; however, the presentation only discussed 9 of these codes including lecturing, real-time writing, follow-up, posing questions, clicker questions, answering questions, moving through the classroom, 1-on-1 discussions, and administration. An initial examination of the COPUS protocol was undertaken during an upper-division sport management course. This pilot allowed us to determine which codes from the COPUS protocol were relevant in this setting and what additional codes might need to be added. Also, experience with the teacher's instructional style allowed both authors to add codes not included in the COPUS protocol. Also from the pilot study, we determined two-minute intervals, used in the COPUS protocol, were sufficient, and an instrument for data collection was created.

The institution where data collection took place was a large, four-year, public institution in the Midwest. During the spring semester of 2014, the first author collected data during the second author's class. Out of the 29 class periods in the semester, data were collected during 22 of the class periods (data were not collected on test days or when the class was taught by the first author). Introduction to Sport Management is a required prerequisite for admission into the sport management program at the university. Students in the course were primarily first- and second-year students; however, upper-level students could take the course as an elective. Course enrollment was 89. The survey course introduced students to a variety of topics in sport management. Every two minutes (determined by starting a stopwatch at the time class began and using it to determine when two minutes had passed), three pieces of data were collected; what the teacher was doing, what the students were doing, and what the entire class was doing. A Microsoft Excel spreadsheet was created with the definitions of the codes, a column for student activity, a column for instructor activity, and a column for the time point (i.e., 2 minutes, 4 minutes, etc.).

Codes for the students' activities taken from COPUS included listening, individual thinking, clicker questions, worksheet group work, answer the teacher's questions, and student asks a question. Two codes were added for Jeopardy and videos. Teacher codes included lecturing, posing questions, using clicker questions, answer questions, offering Jeopardy, moving through the classroom, having one-on-one discussions with students, managing administration of the class, and watching videos. Table 1 lists the codes and their operational definitions for coding.

Additionally, class time was coded as either whole class, groups, pairs, or individual. This coding was done to reflect the amount of time students spent in each of these roles as well as to indicate the split between group and pair work. Only one coder was used and training consisted of attending the original COPUS presentation, reviewing the taped presentation and its slides, and completing the pilot study on an upper-level course.

Since percentages and frequencies were sought, data were analyzed using formulas within a Microsoft Excel spreadsheet. This also provided the capability to easily make graphs of data. After the semester ended, percentages of each category were calculated for data reporting for student activity, teacher activity, and whole class activity. Also, the number of times students' activities changed during each class period was counted. The activity changes were summed across the entire semester and divided by the number of days data were collected to obtain an average.

Students also were sent an anonymous online survey link during the first week of classes asking their perceptions of in-class and out-of-class activities, lecture time, and their learning styles. The survey asked students to rate each learning strategy on a 5-point Likert scale (strongly disagree to strongly agree). Students were asked to indicate whether each strategy positively impacted their learning and whether they enjoyed participating in the activity. At the end of the semester, students were sent the same online survey link anonymously. Descriptive statistics and correlations were run for both the pre- and post-course surveys using SPSS Version 20.

TABLE 1. Operational definitions of student and instructor codes for adapted COPUS protocol.

Code	Operational Definition
	Student
Listening	Used when students were being lectured to, followed up with, or instructed how to complete a task.
Individual thinking	Used when the instructor asked students to think about a question or prompt, including when they were asked to write about it.
Clicker questions	Used when students were asked to respond to Poll Everywhere questions.
Worksheet group work	Used when students completed group work, including application and problem-solving activities, working through article questions or review questions, or discussing a course concept.
Answering questions	Used when students responded to questions posed by the instructor.
Student questions	Used when students asked the instructor a question.
Jeopardy	Used when Jeopardy was played as a review prior to tests.
Video	Used when a video was shown in class to reflect the use of multimedia in the classroom.
	Instructor
Lecturing	Used when the teacher was presenting a topic or idea in front of the class.
Posing questions	Used when the teacher asked a question of the class.
Clicker questions	Used when the teacher was presenting Poll Everywhere questions to students.
Answering questions	Used when the teacher was responding to a student's question in whole class discussions.
Moving through the classroom	Used any time the teacher circulated through the classroom to stop and check-in with groups, listened to what students were saying, or helped students complete an assignment.
1-on-1 discussions	Used when the teacher stopped to have an individual discussion with a specific student or group.
Administration	Used when the teacher was explaining an assignment or group task, reviewing a test, or sharing feedback on assignments.
Jeopardy	Used when Jeopardy was played as a review before tests.
Videos	Used when a video was shown in the classroom.

RESULTS

Results are reported separately for in-class coding and students' quantitative survey responses. Research question 1 was answered using the class observation data. The remaining research questions were addressed using student survey data.

The percentages of class time for each coded student activity are presented in Figure 1. Students spent more than half of the class time (57%) engaged in various activities other than listening. The activity engaged in most often was group work (16%) followed closely by answering instructor questions during group discussions (15%). Students spent 43% of the time listening to the instructor, which included time spent lecturing, explaining assignments, or conducting other administrative tasks. On average, the activity in class was changed approximately every 10 minutes.

Figure 2 details the breakdown of class time the teacher spent engaged in various activities. The teacher spent the greatest amount of class time lecturing (30%). This was followed by time spent moving through classroom as students worked in pairs, groups, or individually on course concepts and applications (21%). The third most common instructor activity was posing questions to students during class discussions (16%).

Figure 3 illustrates the amount of class time spent working as a whole class, in groups, in pairs, and individually. The majority of time was spent lecturing or listening and discussing as a whole class (72%).

Prior to taking the course and after completing the course, students were asked approximately what percentage of class time they believed should be spent listening to lectures. Students responded the average amount of time the teacher should lecture during a class was 61.2% of the time. The post-course survey revealed students believed teachers should lecture 66.3% of the time. A t-test revealed the difference in average lecture time (-5.1%) from pre- to post-surveys was not significant, $t(93) = -1.11$, $p = .269$.

Students' ratings of whether they perceived that each learning strategy positively impacted their learning also were tabulated. The difference between the pre-survey mean scores and the post-survey mean scores was tested. Means and results from t-tests are reported in Table 2. Four of the activities had significant differences in ratings from pre- to post-course surveys. These included blogs, out-of-class writing assignments, minute papers, and working in pairs.

FIGURE 1. Student activity in the classroom.

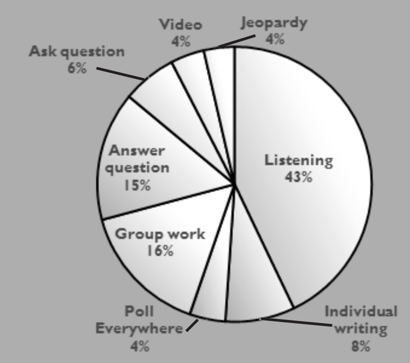


FIGURE 2. Teacher activity in the classroom.

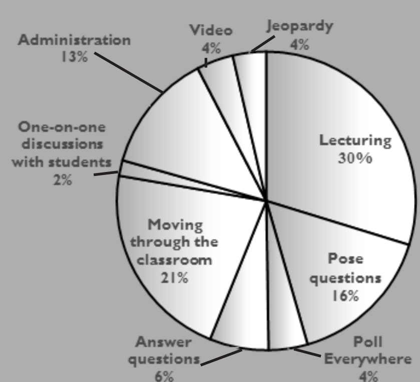
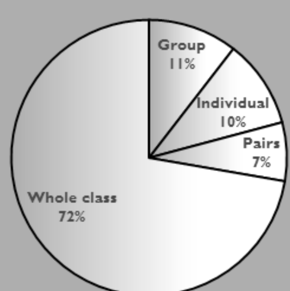


FIGURE 3. Use of classroom time.



Students' perceived that all of these activities had a significantly higher impact on their learning after taking this course.

To measure students' perceived enjoyment of learning strategies, they were asked to indicate how much they agreed with the statement, "I enjoyed (name of learning strategy)." Table 3 reports the mean scores on both the pre- and post-survey and the results of significance testing. Students' perceptions of the enjoyment of two learning activities increased significantly from pre- to post-course surveys. After taking this class, students indicated their enjoyment of minute papers and out-of-class writing assignments increased. To examine the relationships between students' perceived enjoyment of the activities and their perceived impact on learning,

TABLE 2. Students' scores of the perceived impact of learning strategies.

Learning Strategy	Pre-Survery Mean	Post-Survey Mean	t-value	df	p-value
Blogs	2.86	3.79	-4.10	88	<.001*
Exploratory writings	3.66	3.63	.12	80.83	.90
Learning management system	3.96	3.72	1.31	101	.19
Minute papers	3.29	3.74	-2.38	100	.02*
Out-of-class writing assignments	3.39	4.02	-3.13	104	.002*
Pairs	3.53	3.98	-2.11	102	.04*
Poll everywhere	3.54	3.82	-1.32	100	.19
PowerPoint slides	4.27	4.32	-.32	101	.75
Review games	4.16	4.09	.35	101	.72
Review questions	3.83	4.13	-1.74	103	.09
Small groups	3.76	3.85	-.43	104	.67
SoftChalk	3.13	3.35	-.99	79.93	.33
Video	4.29	4.00	1.77	99	.08

Notes. Sample sizes differed so Levene's test for equality of variances was used to determine the correct test statistic. * = significant at p = .05.

correlations were run between the impact and enjoyment of each learning strategy with itself on the post-survey (i.e., impact of blogs with the enjoyment of blogs). Significant correlations are reported in Table 4. The strongest significant correlations of students' perceptions of the impact and enjoyment of learning strategies were for minute papers, blogs, working in pairs, and exploratory writing. While students found videos, review questions, and out-of-class writing assignments both impactful and enjoyable, these relationships were the weakest.

DISCUSSION

Over time, the teacher in this course has made a concerted effort to add more active learning strategies into her teaching in an attempt to actively engage students more and improve their learning. After reading books on engaging students and attending presentations on this topic, the importance of this goal increased. However, it was clear this approach needed to be evaluated, which was the purpose of this action research project. Using a classroom observation approach adapted from the COPUS protocol used in STEM courses and students' perceptions of their own learning, we endeavored to answer whether the continuing practice of adding active learning strategies resulted in a more active classroom environment and increased students' perceptions of their learning.

This research demonstrates students enjoyed the more active pedagogical approach and perceived it as positively impactful on their learning as well as enjoyable. Students spent most of every class period doing something other than listening to lectures. They were asked questions to answer verbally or in writing. Alternatively, students were asked to talk with classmates to develop responses to questions or discuss concepts more fully. Pairs and groups, which were changed for every class and oftentimes within classes, helped students learn from each other as well as forced reticent students

TABLE 3. Students' scores of the perceived enjoyment of learning strategies.

Learning Strategy	Pre-Survery Mean	Post-Survey Mean	t-value	df	p-value
Blogs	2.90	3.14	-1.01	80.40	.32
Exploratory writings	3.13	3.30	-.82	78.07	.41
Learning management system	3.72	3.59	.64	92	.53
Minute papers	3.20	3.59	-2.09	93	.04*
Out-of-class writing assignments	2.88	3.34	-2.06	93	.04*
Pairs	3.63	3.68	-.27	90	.79
Poll everywhere	3.63	3.86	-1.05	91	.30
PowerPoint slides	4.00	3.95	.25	92	.80
Review games	4.04	4.05	-.02	90	.98
Review questions	3.42	3.45	-.16	94	.87
Small groups	3.66	3.70	-.24	92	.81
SoftChalk	3.28	3.36	-.36	68.82	.72
Video	4.16	3.98	1.08	92	.28

Notes. Sample sizes differed so Levene's test for equality of variances was used to determine the correct test statistic. * = significant at p = .05.

TABLE 4. Correlations between perceptions of impact and perceptions of enjoyment of learning strategies.

Learning Strategy	r (all significant at p = .05)
Minute papers	.74
Blogs	.67
Pairs	.67
Exploratory writing	.65
Small groups	.64
Review games	.62
Learning management system	.60
Poll Everywhere	.57
PowerPoint slides	.50
SoftChalk	.43
Out-of-class writing assignments	.38
Review questions	.37
Videos	.36

to talk with and learn from classmates. The occasional use of the free version of Poll Everywhere, which is limited to 40 responses, was used for answers from pairs or triads. This polling system was used for review as well as to assess what students had, or had not yet, learned. Jeopardy games and minute papers also helped formatively measure learning so any unclear information could be retaught or reviewed. Short videos were used almost every class to reinforce key concepts and make real-world applications. These learning strategies periodically punctuated lectures making the 75-minute class more engaging for students. The goal of changing the classroom activity every 10 minutes was met, confirming that the teacher's careful planning and effort has been effective in meeting this teaching goal.

Just as the students were active, so was the teacher. She lectured an average of less than one-third of each class. She repeatedly asked students lower- and higher-order questions and encouraged students to ask her questions. Whenever students were working in pairs or groups, she walked around the classroom, answered queries when students asked them, and asked students follow-up questions. She used these interactions to make applications, determine any "muddy points," and build rapport with students, all of whom she knew by name. Similarly, whenever students were writing answers, talking about answers, or responding to Poll Everywhere or Jeopardy questions, she facilitated learning one-on-one and in small groups.

Students' perceptions of the amount of time spent lecturing did not change significantly from the beginning to the end of the course. This may be because students took many lecture-based classes that impacted their expectations of what a college class should be. Additionally, students may prefer lectures because it allows them to disengage from their learning or spend time on their mobile devices. This may indicate faculty have extensive work to do to re-program students' expectations since a myriad of research confirms students learn more when actively engaged.

Because each student learns differently, as Bonwell and Eison (1991), Burgan (2006), and many others have found, it was expected students would vary in their preferred learning strategies. Many students rated differing strategies, such as review games, PowerPoint slides, review questions, and videos, as impactful to their learning. In the post-course survey, there was a significant increase in the rating of the impact of blogs on learning. On the first day of class when students were told they were required to post responses to questions on blogs via the learning management system, the newness of this requirement may have seemed disconcerting. But, as the semester progressed, students became more comfortable writing responses, and results suggested they realized completing this assignment added to their learning, potentially because they had to complete the readings so they could answer the questions.

Not surprisingly, students enjoyed review games, Poll Everywhere, PowerPoint slides, and videos. They also enjoyed working in pairs and small groups. The engaging nature of the review games, polling system, and working with classmates appeared to involve them physically and mentally. Student ratings of the impact of working in pairs on their learning also increased significantly from pre- to post- survey, indicating students may have gained a greater appreciation for one-on-one discussions with peers and used this time to clarify and apply course concepts.

Significant correlations were found between the active learning strategies students believed were impactful on their learning as well as enjoyable. The highest correlated learning strategy used in this class was minute papers. Used periodically at the conclusion of classes dedicated to each major topic, the questions of "what was the most important thing you learned?" and "what point about this topic do you still have a question about?" enabled students to anonymously reflect on what they learned and especially to identify any subtopics they would like to have explained more fully or clearly. Within one day, the teacher posted the answers to every question asked by students on the learning management system and then followed-up by answering any remaining questions. Students, even those less willing to speak up in class, likely felt they could get their questions answered through the minute papers.

Most surprising was that blogs had an equally high correlation to working in pairs. This suggests students realized blogs helped them learn while not being too onerous to complete, and also suggested students liked and learned from classmates. Because blogs can be used to encourage students to read, the fact that students perceived them as both helpful to their learning and enjoyable should persuade teachers to use them in their courses.

This action research project was illuminating because it affirmed how class time was used with an emphasis on the engagement of students in a variety of learning activities. The data about how class time was spent by the students and teacher provide evidence that the goal of the teacher to make each class learner-centered, rather than teacher-centered, was met. Anecdotal comments from students also confirmed how much they appreciated the variety in learning activities in every class. Seldom were students perceived by the teacher as disengaged. The anonymous pre- and post-course surveys allowed students to inform us about how they perceived the impact of the strategies on learning as well as what they enjoyed. Collectively these data reinforce the value and importance of engaging students actively in their learning and evaluating the strategies used to facilitate learning.

LIMITATIONS AND FUTURE RESEARCH

One limitation of this research is the use of one class to evaluate the COPUS protocol and active learning in a classroom. However, because this was designed as action research, it was not meant to generalize findings about students, but rather to suggest a way faculty can evaluate classrooms. Also, claims about actual impacts on learning cannot be made as changes in student learning were not examined, only changes in their perceptions of the usefulness and enjoyment of learning activities were sought. Finally, while data were collected about what the instructor and students were doing during class, data were not collected on how engaged individual students were in activities or how intently they were listening to lecture. While we can anecdotally attest to the high level of engagement of students during class, no empirical evidence of this was examined in this study.

Future research should attempt to demonstrate whether a more active classroom environment has a greater impact on actual student learning (i.e., performance on exams or class projects). Potentially, this could be done by offering two sections of a course, one where students are primarily lectured to and another where students are primarily involved in active learning activities, and comparing student performance. Also, a teacher who currently primarily uses lecture could assess his or her current students and then progressively add more active learning components each semester, continually assessing students each semester. Then, the results from each semester could be compared to better understand the impacts of active learning on students' learning. Teachers in sport management and other disciplines could evaluate their teaching using the adapted protocol and continue to improve and expand its use.

CONCLUSION

This research is important for multiple reasons. First, the results suggest to us that the goal of engaging students instead of merely conveying information was met as the instructor lectured only about a third of class time. Second, students perceive that many active learning strategies have a positive impact on their learning, which makes these strategies an important addition for teachers who wish to connect with students in ways they value. Third, it encourages evaluation of classrooms and courses as the protocol was easy to use and follow, and surveys are inexpensive and easily disseminated online. Potentially, teachers could involve undergraduate and graduate students in research by asking them to attend and observe their classrooms during a semester to evaluate their own classroom activity by using the adapted COPUS protocol described in this study. Additionally, teachers can partner with a colleague or reach out to on-campus teaching resources to create an evaluation plan for their classrooms.

Evaluating how class time is spent is a valuable endeavor as accountability for student learning rests partly with the teacher. Evaluating teaching and engaging students in active learning is important and should be undertaken in higher education classrooms in the United States and internationally. As suggested by Angelo and Cross (1993), the best way to improve learning is to improve teaching, which requires constant and consistent assessment of teaching strategies and classroom environment. Instead of spending time talking at students, teachers should strive to engage students in activities and discussions to improve their learning and enjoyment of class. In fact, teachers with an evaluation strategy should be willing to try different activities to improve student learning and then assess their impact. Then, teachers can determine what does and does not work for their students to improve use of class time. Simply imparting knowledge to students is an archaic view of a college education. A realistic view of how the class is conducted gives the teacher valuable feedback as part of effective teaching. With a tested protocol as a guideline, more teachers can assess their classroom environments.

Students should be the focus of every course. Clearly, students believe active learning strategies are enjoyable and have positive impacts on their learning, which should encourage teachers to implement these strategies in the classroom. Additionally, pairing students' feedback with other assessment tools gives teachers a diverse view of what is happening in their classrooms beyond what can simply be seen. If skilled teachers will do whatever helps students learn (Brookfield, 2006), then they will make concerted efforts to understand what helps students learn, including what students believe will help them learn. If student perceptions are included as part of the evaluation strategy, the teacher no longer has to guess about student engagement based on body language in class. Additionally, gathering student perceptions gives the teacher the opportunity to make changes to the course that will likely benefit the next group of students. Eventually, students will appreciate teachers who value their feedback, and this could potentially increase teachers' effectiveness. With the increased focus on classroom assessment and documentation of student learning, teachers should incorporate a review of how class time is used and student perceptions as part of their self-evaluation strategy.

REFERENCES

Angelo, T. A., & Cross, K. P. (1993). *Classroom assessment techniques: A handbook for college teachers*. San Francisco, CA: Jossey-Bass.

Azriel, J. A., Erthal, M. J., & Starr, E. (2005). Answers, questions, and deceptions: What is the role of games in business education? *Journal of Education for Business, 81*(1), 9-13.

Bachman, L. R., & Bachman, C. M. (2011). A study of classroom response system clickers: Increasing student engagement and performance in a large undergraduate lecture class on architectural research. *Journal of Interactive Learning Research, 22*, 5-21.

Baepler, P., Walker, J. D., & Driessen, M. (2014). It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers and Education, 78*, 227-236.

Bain, K. (2004). *What the best college teachers do*. Cambridge, MA: Harvard University Press.

Barber, M. (2007). Reassessing pedagogy in a fast forward age. *International Journal of Learning, 13*(9), 143-149.

Bergmann, J., & Sams, A. (2014). Flipping learning: Gateway to student engagement. *Learning and Leading with Technology, 41*(7), 18-23.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom.* Retrieved from http://files.eric.ed.gov/fulltext/ED336049.pdf

Brookfield, S. D. (2006). *The skillful teacher: On technique, trust, and responsiveness in the classroom* (2nd ed.). San Francisco, CA: Jossey-Bass.

Burgan, M. (2006). In defense of lecturing. *Change, 38*, (6), 30-34.

Chasteen, S. V., Perkins, K. K., Beale, P. D., Pollock, S. J., & Wieman, C. E. (2011). A thoughtful approach to instruction: Course trans formation for the rest of us. *Journal of College Science Teaching, 40*(4), 24-30.

Cheng, G., & Chau, J. (2011). A comparative study of using blogs and wikis for collaborative knowledge construction. International *Journal of Instructional Media, 38,* 71-78.

Chickering, A. W., & Gamson, Z. F. (1987, March). Seven principles for good practice in undergraduate education. *AAHE Bulletin,* 3-7. Retrieved from http://files.eric.ed.gov/fulltext/ED282491.pdf

Covell, A. E. (2011). College students' perceptions of the traditional lecture method. *College Student Journal, 45*(1), 92-101.

D'Angelo, J. M., & Woosley, S. A. (2007). Technology in the classroom: Friend or foe. *Education, 127*, 462-471.

DeBourgh, G. A. (2008). Use of classroom "clickers" to promote acquisition of advanced reasoning skills. *Nurse Education in Practice, 8,* 76-87.

Doyle, T. (2008). *Helping students learn in a learner-centered environment: A guide to facilitating learning in higher education.* Sterling, VA: Stylus Publishing.

Feden, P. (2012). Teaching without telling: Contemporary pedagogical theory put into practice. *Journal on Excellence in College Teaching, 23*(2), 5-23.

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences, 111*, 8410-8415.

Hsu, H., & Wang, S. (2011). The impact of using blogs on college students' reading comprehension and learning motivation. *Literacy Research and Instruction, 50*, 68-88.

Knight, J. K., & Wood, W. B. (2005). Teaching more and lecturing less. *Cell Biology Education, 4,* 298-310.

Larson, L. R., & Lovelace, M. D. (2013). Evaluating the efficacy of questioning strategies in lecture-based classroom environments: Are we asking the right questions? *Journal on Excellence in College Teaching, 24* (1), 105-122.

Lom, B. (2012). Classroom activities: Simple strategies to incorporate student-centered activities within undergraduate science lectures. *The Journal of Undergraduate Neuroscience Education, 11*, A64-A71.

Lowerison, G., Sclater, J., Schmid, R. F., & Abrami, P. C. (2006). Are we using technology for learning? *Journal of Educational Technology Systems, 34,* 401-425.

Lumpkin, A., Achen, Rebecca M., & Dodd, Regan K. (2015). Student perceptions of active learning. *College Student Journal, 49* (1), 121-133.

Machemer, P. L., & Crawford, P. (2007). Student perceptions of ac -tive learning in a large cross-disciplinary classroom. *Active Learning in Higher Education, 8*, 9-30.

Malm, E., & Defranco, J. F. (2011-2012). Toward a student-centered measure of learning management system utilization. *Journal of Educational Technology Systems, 40*, 401-413.

Michael, J. (2006). Where's the evidence that active learning works? *Advances in Physiology Education, 30*, 159-167.

Millis, B. J. (Ed.). (2010). *Cooperative learning in higher education: Across the disciplines, across the academy.* Sterling, VA: Stylus Publishing.

Millis, B. J. (2012). *IDEA Paper No. 53: Active learning strategies in face-to-face courses*. Manhattan, KS: The Idea Center. Retrieved from http://www.theideacenter.org/sites/default/files/paper-idea_53.pdf

Mohamed, A. (2008). Effects of active learning variants on student performance and learning perceptions. *International Journal for the Scholarship of Teaching and Learning, 2* (2), 1-14.

Nunn, C. E. (1996). Discussion in the college classroom: Triangulating observational and survey. *Journal of Higher Education, 67,* 243-266.

Sevian, H., & Robinson, W. E. (2011). Clickers promote learning in all kinds of classes — Small and large, graduate and undergraduate, lecture and lab. *Journal of College Science Teaching, 40* (3), 14-18.

Smith, M. K., Jones, F. H. M., Gilbert, S. L., & Wieman, C. E. (2013). The classroom observation protocol for undergraduate STEM (COPUS): A new instrument to characterize undergraduate STEM classroom practices. *CBE-Life Sciences Education, 12*, 618-627.

Van Amburgh, J. A. Devlin, J. W., Kirwin, J. L., & Qualters, D. M. (2007). A tool for measuring active learning in the classroom. *American Journal of Pharmaceutical Education, 71*(5), 1-8.

Welsh, A. J. (2012). Exploring undergraduates' perceptions of the use of active learning techniques in science lectures. Journal of College Science Teaching, 42 (2), 80-87.

Wieman, C., & Gilbert, S. (2014). The teaching practices inventory: A new tool for characterizing college and university teaching in mathematics and science. *CBE—Life Sciences Education, 13,* 552–569.

Wieman, C., Perkins, K., & Gilbert, S. (2010). Transforming science education at large research universities: A case study in progress. *Change, 42* (2), 7-14.

Wright, D. G., & Abell, C. H. (2011). Using YouTube to bridge the gap between baby boomers and millennials. *Journal of Nursing Education, 50,* 299-300.