

STUDENT PERCEPTION TOWARDS ACTIVE LEARNING AND COLLABORATIVE
LEARNING SPACES

By

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Dedication

I would humbly like to dedicate this thesis to my mom and dad, who always support me in all my endeavors.

Thank you for all your prayers, sacrifices, constant love, and encouragement. I am forever grateful and blessed to have you both as my parents. Thank you for teaching me that “education is the key” and that with it, the opportunities are endless. This is just the beginning!

Love you both, always and forever.

Table of Contents

Abstract.....	4
What is Active Learning?.....	5-6
Collaborative Learning Spaces.....	7
Pros and Cons.....	8-12
University of Arizona: Utilization of Collaborative Learning Spaces.....	13-14
Student Perceptions.....	15-23
Conclusion.....	24
References.....	25-26

Abstract

As researchers begin to learn more about how active learning affects outcomes in college classrooms, faculty has started to embrace these techniques. One question that is not asked very often is: What do students really think about active learning? One study found that some college students feel they learn less when active learning strategies are utilized, yet many learned more, despite their attitudes towards these methods (Timmer, 2019). Why is it that student perceptions towards learning vary? This particularly intrigued us to take a closer look at this dynamic. The aim of our study was to investigate how active learning courses affect student perception. In addition, we wanted to examine the role (if any) of collaborative learning spaces within such classroom environments. While there is literature discussing active learning and instructor perception towards it, there is not as much literature focusing on student perceptions. As such, we conducted this study to build upon this body of work by looking at collaborative learning spaces at the University of Arizona, and how they, along with active learning, influence student attitudes towards learning and learning outcomes. We were particularly interested in how engaged learning makes students feel (are they in favor or opposed to it), what elements make engaged learning effective or ineffective, and much more. Our methods included surveying students majoring in Physiology at the University of Arizona in order to gain more insight about their experiences and perceptions towards active learning and collaborative learning spaces. The data we collected from these surveys allowed us to conclude that on average, students had more positive experiences with active learning in collaborative learning spaces, and overall, had positive perceptions towards it.

Table A. Various types of active learning methods that may be implemented in the classroom.

Type of Learning	Cooperative/Collaborative	Think-Pair-Share	Problem Solving	Technology Focused
Description	Two or more people try to learn or learn something together; work together to think through problems.	Students share their answer to a question with a partner, compare/contrast potential answers, and then come together as a whole class.	Students learn about a topic/subject by working through problems.	The use of computers, clickers, projectors and or other forms of technology in which students can engage in learning.

Collaborative Learning Spaces

Collaborative learning spaces (CLS) are rooms that have been redesigned or re-arranged in order to better facilitate an active learning environment. These classrooms offer a shift from a traditional lecture style hall—in such environments, students sit in table groups rather than in rows. These groups promote student interactions with their peers, and can include anywhere from four to twelve students (Beichner & Cevetello, 2013). In addition, collaborative learning spaces are often equipped with whiteboards and numerous monitors mounted on the walls or on wheels (Beichner & Cevetello, 2013).

In structuring the classroom in this way, instructors have more autonomy in how they conduct their courses. One key feature of collaborative learning spaces is the ability for movement and fluidity. For instance, instructors can move around the room as they teach and engage with various groups of students (Beichner & Cevetello, 2013). Furthermore, students can also move about freely in these rooms and can work out problems as a group on laptops, whiteboards, or even worksheets (Beichner & Cevetello, 2013). Moreover, collaborative learning spaces can allow for discussion between faculty, teaching assistants, and students which is often not a characteristic of traditional lecture halls (Beichner & Cevetello, 2013).



Figure 2. Image of a collaborative learning classroom at the University of Arizona.

Does it Work: Pros and Cons

In a study conducted at the University of Minnesota, Active Learning Classrooms (ALCs), synonymous with Collaborative Learning Spaces (CLSs), were found to have many positive outcomes as it relates to students (Whiteside et al., 2010). The courses taught in the ALCs in this study included hands-on activities in which students had to utilize active learning strategies to come to an answer (Whiteside et al., 2010). Furthermore, these ALCs were equipped with circular tables that could seat nine students, white boards around the room, and monitors for students and instructors to present work (Whiteside et al., 2010). The researchers compared a biology course taught in a traditional classroom (with seating in rows and a platform with the instructor in front of class) to one taught in an ALC (Whiteside et al., 2010). Both classes were taught by the same instructor, and the researchers found that students taught in ALC outperformed their expected grades, while those in the traditional classroom settings did not exceed their expected outcome (Whiteside et al., 2010).

The University of Minnesota study also observed student perception of learning in ALCs. The findings were that students in ALCs felt that the classroom contributed more to their engagement level, classroom fit, quality of learning experiences, and flexibility in regards to learning when compared to students in traditional classrooms (Whiteside et al., 2010). Some students also stated that being in an ALC “forced” them to participate in discussions and critical thinking—many students from the traditional classroom space shared that the classroom did not really have much of an effect on them, good or bad (Whiteside et al., 2010).

Another study, conducted at Texas A&M University, provided interesting insight on group problem solving versus lecture. Two highly experienced chemistry instructors, Dr. Vickie M. Williamson and Dr. Marvin W. Rowe, decided to examine whether students in their

quantitative analysis classes performed better when they worked in groups to complete chemistry problems, or if students learned better in lecture and later worked problems out independently (Williamson & Rowe, 2002). There were two different subject groups. The first group were students who were placed in teams of four and worked collaboratively on problems during class and would also review the solutions in class (Williamson & Rowe, 2002). The second group (the control) attended lectures in which the instructor would go over sample problems in class, but students did not work on problems with their peers during class (Williamson & Rowe, 2002).

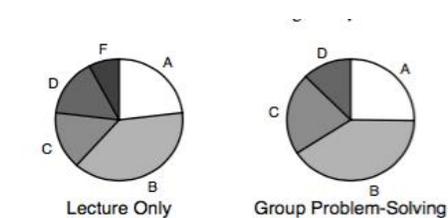


Figure 1. Letter grades for those finishing the course.

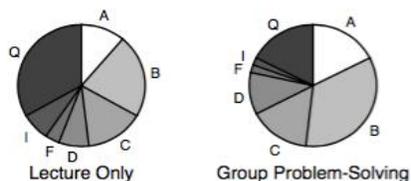


Figure 2. Letter grades for all students beginning the course. I is incomplete; Q is Q-drop withdrawal.

Figure 3. Pie charts from Williamson and Rowe's study comparing letter grades between students who only had lecture and those that worked in groups to solve problems.

Both subject groups were taught by Dr. Rowe and the content material was the same.

The authors found that the students who worked in teams had a 67% proportion of A, B, and C grades while students in the control lecture course had a 48.1% proportion (*see Figure 3*) (Williamson & Rowe, 2002). Furthermore, the students that worked collaboratively had a 17.3% withdrawal rate while those in the control group had a 33.3% rate (Williamson & Rowe, 2002). These findings suggest that perhaps group problem solving has better

outcomes on student grades and retention rates.

Williamson and Rowe also assessed student perceptions and attitudes in their study. For instance, students in the control group expressed that they learned more listening to the lecture rather than working the problems, while students who were in groups said the opposite (Williamson & Rowe, 2002). In addition, the students that worked in groups during the semester

shared that they learned more when they heard their peer's viewpoint (Williamson & Rowe, 2002). To gain a clearer understanding of how the students in groups felt, the authors asked them some questions. One question they presented to a particular student, Tom, was whether "students with lower abilities hold you back?" (Williamson & Rowe, 2002). To this, Tom expressed that this was not the case, and that by having to teach others the concepts, he truly had to master the material (Williamson & Rowe, 2002). Natalie, Tom's group mate who was classified as "the weak one in the group", was asked how she felt about her peers explaining the concepts to her (Williamson & Rowe, 2002). She replied by saying that she likely would have dropped from the course if she did not have her groups help because she felt that her questions were "too dumb" to ask the professor (Williamson & Rowe, 2002). This shows how valuable collaborative learning can be for students because it allows those who may grasp the concepts quickly to further master it by teaching others, while offering those who may struggle the opportunity to bounce ideas off with other students whom they may understand more easily.

While there is much literature that highlights that active learning and collaborative learning spaces have many positive outcomes, there is some literature that suggests otherwise. One particular article written by John Timmer states that students may not enjoy classes that utilize active learning strategies, though they learn more in these classes when compared to traditional lecture style courses (Timmer, 2019). To further explore this theory, researchers set up a study in which a college physics course was divided into two—however, both groups of students were taught the same material (Timmer, 2019). The first half of the class was taught using active learning and the other half was taught through traditional lecture (Timmer, 2019). After two weeks, students from both physics courses were given the same quiz in order to see if the teaching format had any effect on student academic outcomes (Timmer, 2019). When

comparing the quiz results, the researchers found that those in the physics course that implemented engaged learning scored higher than their peers in the lecture course (Timmer, 2019). However, when asked whether they enjoyed the course, those in the active learning physics course rated their enjoyment level about 3.8/5 (five being greatest enjoyment) while those in the lecture course rated their satisfaction about 4.2/5 (Timmer, 2019). These findings were surprising to the investigators. They later found that some students may not enjoy active learning even though it proves to be effective because students were challenged and had to attempt solving physics problems they did not actually know how to solve (Timmer, 2019). Student perceptions and attitudes towards active learning is an area of notable interest. Uncovering more information about why students feel the way they do in certain classroom environments may aid in structuring courses and rooms in ways that improve student outcomes and satisfaction.

Though collaborative learning spaces can facilitate discussion and teamwork, it can also not be ideal or as accessible. Some students may not enjoy sitting with a group of their peers because they may not get along with them, or may feel that their group members are not all contributing fairly (Oakley et al., 2004). Another component that leads to students not taking much interest in collaborative learning spaces is that some instructors do not know how to use the technology in the rooms, or at least “not in a meaningful way” leaving a negative impression on students (Granito & Santana, 2016). Furthermore, collaborative learning spaces can be costly to build, and may require faculty to modify their lecturing styles and course materials (Beichner & Cevetello, 2013). Not all schools may have the financial ability or freedom to create these sorts of learning spaces, and some instructors may be hesitant to change (Beichner & Cevetello, 2013).

The literature explores advantages and disadvantages of active learning methodologies and collaborative learning spaces, as well as student and faculty perceptions towards the aforementioned factors. Nonetheless, there is still more to be researched on this topic. As a result, we decided to add to the existing body of literature by conducting a study of our own, which will be described in the latter portion of this paper.

University of Arizona: Utilization of Collaborative Learning Spaces

Now that we have taken a more in depth look at various studies in the literature, the focus can be shifted to our study on student perception towards active learning and collaborative learning spaces at the University of Arizona (U of A). We will first begin with some background about what collaborative learning spaces at U of A are, how they are equipped, and how they function.

Around the summer of 2014, Dr. John Pollard, a U of A member in the department of Chemistry and Biochemistry, shared his frustration with typical lecture style halls with Dr. Gail Burd, the Senior Vice Provost for Academic Affairs (Burd et al., 2015). Dr. Pollard had been utilizing active learning pedagogies that promote student collaboration in teaching his general chemistry course of about 260 students (Burd et al., 2015). However, he found that traditional lecture style rooms did not facilitate this sort of collaborative work and learning as well, and as a result, wanted to explore a new learning environment (Burd et al., 2015). After a meeting between Dr. Burd, Dr. Pollard, and Karen Williams (the Dean of Libraries) the Collaborative Learning Spaces Project (CLSP) began (Burd et al., 2015).

By Fall of 2014, CLSP was in motion with the Science-Engineering Library Learning Space (SEL CLS) as the pilot (Burd et al., 2015). This room was equipped with wall-mounted and rolling cart mounted projectors, cordless microphones, speakers, short throw projectors, a fully-equipped instructor station, and updated high density wireless networking system (Burd et al., 2015). Furthermore, some items that were rented or borrowed for the pilot included: chairs, tables, desktop whiteboards for each table, A-frame whiteboards on wheels, and much more (Burd et al., 2015). The pilot project included more than 1,400 students and eight STEM faculty members (Burd et al., 2015). They took the feedback received from the pilot participants and

made improvements for these rooms (Burd et al., 2015). CLS rooms at the U of A now include chairs and round/rectangular tables on wheels that can accommodate about two to six students, projectors, screens, monitors, power outlets, microphones, and tabletop and A-frame whiteboards (Burd et al., 2015). Some rooms that have been converted to CLS rooms to date are SEL CLS, Beardown Gym, BioSciences West Rm 301, and Gittings Gym Rm (Burd et al., 2015). Many courses at the U of A are now taught in these rooms all around campus.



Figure 4. Pictured above is Gittings Gym, now Gittings Rm 129B, that was redesigned into a CLS (2019).

Student Perceptions

Introduction

The purpose of our study was to assess student perceptions at the University of Arizona (U of A) towards active learning and collaborative learning spaces (CLS). The literature suggests that the utilization of active learning pedagogies and collaborative learning environments often results in positive student outcomes in courses, though students often vary in their opinions of courses structured in this way. We were interested in further analysis of student perceptions concerning the two aforementioned components, as well as what led them to uphold these perceptions.

Methods

We began our study by proposing our research plan to the Institutional Review Board (IRB) and proceeded once approval was received. We surveyed students majoring in Physiology at the University of Arizona enrolled in the following courses: Cardiovascular Physiology, Physiology of the Immune System, and Integrative Systems Physiology. Students in these courses included juniors and seniors. Some of these courses were taught in CLS and others in traditional lecture halls. Qualtrics was used to generate a ten question survey, and participation was voluntary. It is not known which students participated and which ones did not. The identity of participants was not recorded and their responses anonymous. Students could choose to exit the survey at any time without penalty or decline to answer any question. The link as well as QR code to the anonymous survey was shared with students. Responses to the survey were sent to a link on Qualtrics.com and stored in a password protected online format. The first page of the survey consisted of defining some terminology in our survey as well an electronic consent statement for participating in our study. *Table 1* displays the terminology as defined in our

survey. *Table 2* consists of the questions that appeared on our survey entitled “Student Perception Towards Active Learning and Collaborative Learning Spaces”. The question types were multiple choice (student selects an answer from options listed), and free response (student types in their answer). We received a total of 110 survey responses.

Table 1. Survey Terminology

Term	Definition
Active/engaged learning	Refers to a teaching format in which students participate during class in problem solving, group work, or discussions.
Collaborative Learning Spaces (CLS)	Collaborative learning spaces, specifically at the University of Arizona, are classrooms in which students sit in table groups rather than rows. These rooms often consist of multiple monitors mounted up around the room so that students can view the information being presented to them.

Table 2. List of questions that appeared on Student Perception Towards Active Learning and Collaborative Learning Spaces survey.

1. Have you experienced engaged learning that you found effective at the University of Arizona?
2. If you answered yes to question 1, please explain what made the experience effective at the University of Arizona.
3. Have you experienced engaged learning that you found ineffective at the University of Arizona?
4. If you answered yes to question 3, please explain what made the experience ineffective at the University of Arizona.
5. How would you rate your overall satisfaction with classes in collaborative learning spaces at the University of Arizona (1-lowest & 10-highest)?
6. How does active learning make you feel at the University of Arizona?
7. Did your perception of the class change from beginning to end at the University of Arizona?
8. Did your perception of engaged learning change from beginning to end at the University of Arizona?
9. If you had the chance would you take another course in a collaborative learning space at the University of Arizona?
10. Any other comments?

Results

Our results were gathered from our anonymous Qualtrics survey. Of the 110 survey responses, about 84 met the criteria and were used for analysis. As shown in *Figure 5*, 96% of students experienced engaged learning they found effective at the U of A while 4% did not experience effective engaged learning. Survey participants were also asked if they experienced engaged learning they found to be ineffective. Of the data collected, 51% answered ‘yes’ and 49% answered ‘no’, as displayed in *Figure 6*. *Table 3* shows some of the various reasons students provided explaining what made their engaged learning experiences effective or ineffective.

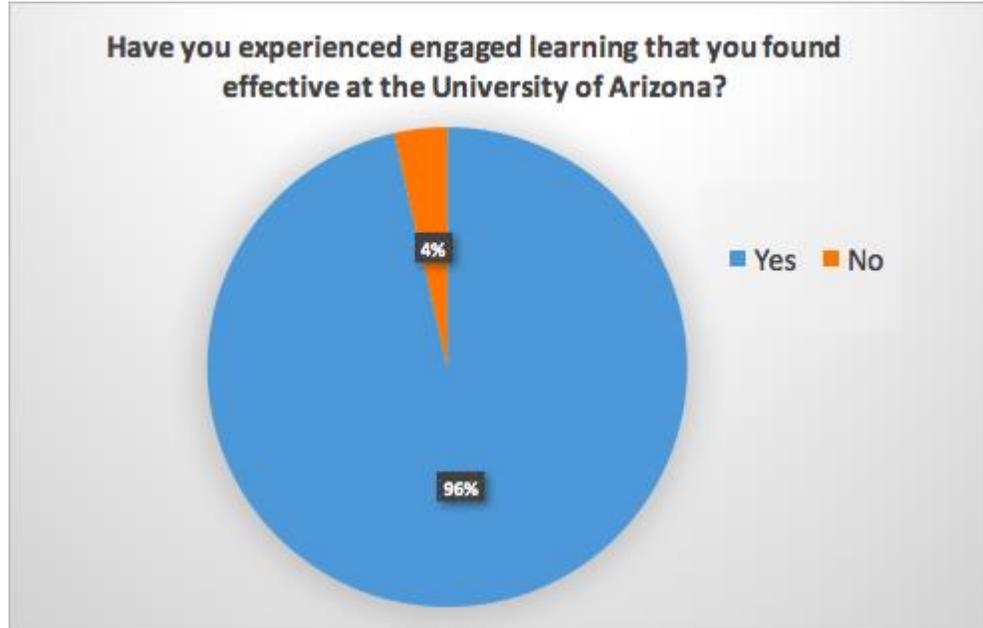


Figure 5. Student responses to whether they have experienced effective engaged learning at the University of Arizona. Blue represents yes and orange is no.

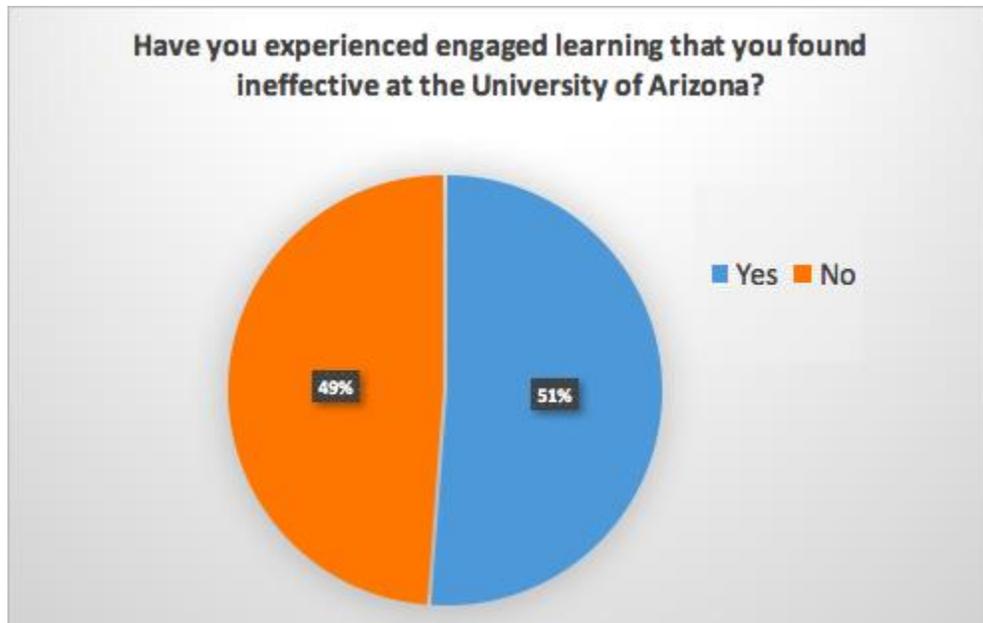


Figure 6. Student responses to whether they have experienced ineffective engaged learning at the University of Arizona. Blue represents yes and orange is no.

Table 3. Some explanations given by survey participants about what made their engaged learning experience effective and ineffective.

Reasons engaged learning experience was effective:	Reasons engaged learning experience was ineffective:
<ul style="list-style-type: none"> ● “Collaboration and discussion with other students is very helpful and I learn much better than in a more traditional lecture.” ● “Sometimes peers are better able to explain the concepts that we learn in ways that make sense to me. I’m also able to see how other people think/learn and use their study skills to enhance mine.” ● “I was able to learn the material in a hands on way which is easier to understand and commit to memory.” ● “Explaining my thought process to others and rationalizing my thoughts helps improve the foundational concepts that I’m learning.” ● “I find I learn better when engaging with the material (instead of just being lectured at).” ● “Greater participation.” ● “Collaboration and applying the subject matter to the real world.” ● “I find that giving students time to work on a problem/question, talk with their tablemates, and ask the TAs/preceptors questions is the most effective learning environment for me. It allows me to address my own specific concerns, help my tablemates with their concerns, and stay focused on the class for the duration of the meeting time.” 	<ul style="list-style-type: none"> ● “Plain lecturing with no break for questions.” ● In certain collaborative settings or group projects, there are instances where a particular student carries much more weight than the rest of the group.” ● “Sometimes the questions we are asked to discuss are too surface level so instead of having an engaging conversation, we ended up off task.” ● “Engaged learning in lecture-style classrooms makes it more difficult for me to engage with my peers so discussions are minimal and less effective.” ● “I was not given enough time and the activity was pertinent to what we were discussing.” ● “The professor randomly assigned groups to the entire class. I ended up with a group that was not willing to actively engage with the material, so it made the experience frustrating and ineffective.” ● “I needed more clarification before jumping into a discussion.” ● “I find it to be ineffective when the room is too large. This just gives the same experience as a regular auditorium.”

Another component of our study was to better understand what physiology students thought about CLS. Survey participants were asked to rate their overall satisfaction with classes in CLS at the U of A on a scale from one to ten; one being the lowest satisfaction and ten being

the highest. The average satisfaction rating was 8.31. Furthermore, students were asked how active learning makes them feel. *Table 4* displays some responses to this question.

Table 4. How students say active learning makes them feel.

- “It makes me feel like I have a greater understanding of the topics. It also facilitates making friends who you can study with!”
- “Sometimes intimidating but usually find it helpful.”
- “Stressed if I do not like my group.”
- “Good, engaged.”
- “LOVE.”
- “Sometimes uncomfortable but I like getting actual help from the professor and working through problems as a class or group.”
- “Positive. I like knowing that even if I don’t understand something well, I can ask my peers for support. Active learning is more engaging than a 50+ minute lecture, so I like that aspect as well.”
- “It made me feel more confident in my answers with classmates. However, I also feel dumb sometimes because we all don’t know the answer.”
- “Engaged, inspired, inquisitive, valued.”
- “To me, active learning makes me feel more alert and engaged because listening to lectures can be more passive.”
- “It makes me feel like my voice matters and helps me to appreciate my peers’ point of view.”
- “Warm and fuzzy.”

When asked about whether their perception of the class changed from beginning to end, 62.5% said ‘yes’ and 37.5% said ‘no’. Additionally, 58.75% of students said that their perception of engaged learning changed from the beginning to end of the class, while 41.25% said that their perception did not change. Taking the previous questions into account, participants were asked whether they would take another course in a CLS at the U of A if they had the chance. Responses to this question were as follows: 91.25% yes, 3.75% no, and 5% maybe (see *Figure 7*).

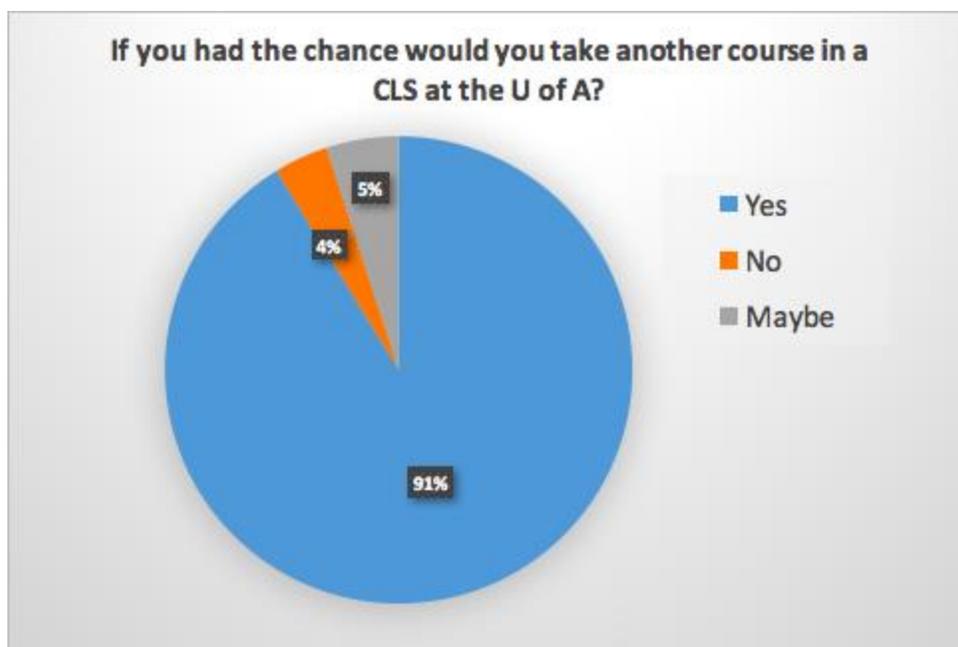


Figure 7. Student responses to whether they would take another course in a CLS space at the University of Arizona. Blue is yes, orange is no, and grey is maybe.

The last question on our survey allowed participants to share any additional comments they may have had. Some sample responses are shown in *Table 5* below.

Table 5. Additional comments participants had on the survey.

- “I think collaborative spaces work for some classes, but not all. In classes that require getting through a lot of material, collaborative spaces would probably waste more time than be beneficial to students.”
- “Collaborative learning spaces are incredibly beneficial for this major since the content is so dense, but may not be as helpful in other majors. It would be interesting to see if there is a difference in attitude and performance across majors.”
- “I think that having collaborative learning spaces is a fun way to learn and critically think about questions.”
- “Collaborative spaces are the way to go! They need to be refined in some cases to maximize use of class time.”
- “I would like there to be classes that are taught both traditionally and collaboratively so that students can choose the class with modality that they like better.”
- “Active learning is the best way to learn for many students. I sure hope UA will invest in more collaborative learning spaces for future students.”

Discussion

The primary purpose for our study was to further look at what students think about active learning as well as CLS. While there is literature discussing the effectiveness of active learning pedagogies, as well as the utilization of CLS and instructors' perceptions, we were interested in looking at student perceptions specifically. Results from our research suggest that students tend to feel more positively about active learning. Some students shared that active learning made them feel more engaged, and allowed them to better understand content taught in class. However, some students shared that active learning can be ineffective if there are no breaks for questions, or if there is not enough time provided to complete activities. Perhaps refining the structure of some courses will lead to more positive perceptions as well. Furthermore, students on average had more positive attitudes towards CLS. Study participants shared that when done correctly, CLS help facilitate good discussion amongst peers and faculty, and 91% stated that they would take another course in a CLS. Additionally, students rate their overall satisfaction with these rooms an 8.31 out of 10, which is about what we expected prior to conducting our study. While some students may feel a little uncomfortable initially working in groups, many expressed that with time, they were able to appreciate the various perspectives their peers had on the course material. One of the more interesting components of our results is how active learning makes students feel. Students on average also have more positive feelings, and noted that they feel more confident, inquisitive, valued, and inspired. Though most perceptions are positive, some share that active learning can feel intimidating but overall helpful. These findings also fall in line with our prediction that students overall perceive active learning and CLS to be positive when activities, lecture, and group mates are all integrated effectively.

While the findings of our study provide greater insight to student perceptions and attitudes towards engaged learning and CLS, there are some limitations. Our sample size was about 84 and only included physiology students in select classes at the U of A. Additionally, our survey allowed students to leave some questions unanswered for any reason of their choosing, so our results may not be reflective of all study participants, though we did not include some responses in our analysis for this reason. In future studies implementing focus groups and surveying across various majors at the U of A could provide more depth and scope.

Conclusion

Overall, students have positive perspectives toward active learning and collaborative learning environments. Despite some initial feelings of uncomfortability, students feel that they are more alert and engaged in courses in which the instructor incorporates questions, problems, or discussions that encourages them to actively participate and collaborate with their peers. Nonetheless, students do feel that while CLS spaces are very useful in some classes, they may not be suitable for all. As a result, instructors should keep this in mind when structuring and refining their courses. Of the study participants, 91% said that if given the chance, they would take another course in a CLS, implying that reservations students may have towards CLS and engaged learning are eclipsed by how effective these learning environments can be. Many students shared that they felt they learned more in engaged learning environments, and benefited from working together with a group of their peers. This is a significant finding because it suggests that perhaps more universities should invest in the creation of CLSs and should integrate learning methodologies that prompt students to actively rather than passively participate.

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