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What Drives Student Engagement: Is it Learning Space, Instructor Behavior, or Teaching Philosophy?

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This study investigates how instructor teaching philosophy (traditional vs. constructivist) and type of learning space (traditional vs. active) influence instructor perceptions of student engagement. In a quasi-experimental study, we found that instructors perceived that students were more engaged in the active learning classroom (ALC) than in the traditional classroom. In addition, we found that instructors with a more constructivist philosophy perceived that students engaged more actively in learning. On closer analysis, however, the difference in perceived student engagement was only significant between more versus less constructivist philosophy when in the ALC. Finally, we found that the relationship between teaching philosophy and student engagement in the ALC was mediated by instructor behavior.

Introduction

Concerns about failure rates, reduced levels of conceptual understanding, and high absenteeism are all reasons why colleges and universities have looked for alternatives to traditional lectures as the primary mode of instruction (Baepler, Brooks, & Walker, 2014). Recently, some institutions have embraced new designs for learning spaces that include modular seating arrangements, more availability and diversity of technology, and low-tech tools like whiteboards that facilitate group interaction. With increased investment in these new designs, known as the active learning classroom (ALC), there is a need to determine the efficacy and efficiency of these new space designs. As a result, a relatively new field of study has emerged that examines the influence of learning spaces on instructor behavior, student engagement, and student learning outcomes. This field of learning spaces primarily looks at how space influences instructor and/or student behavior. While classroom design is an important factor, many other factors might influence what happens in the classroom (e.g. teaching philosophy, instructor behavior, and students' prior learning experiences). Furthermore, it is difficult to control or measure some of these variables. As a result, there has been a call for more rigorous empirical research (Brooks, 2010; Felix & Brown, 2011; Temple, 2008). Finally, because space is a major cost component of educational delivery, gaining a better understanding of how space influences the learning process is critical for educational institutions making resource allocation decisions.

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Literature Review

Prior studies found that the type of learning space can influence creative thinking (Jankowska, 2007), add excitement for both the student and instructor, and enhance teaching and learning experiences (Amedeo, Golledge, & Stimson, 2009; Lippincot 2009; Long & Heleton, 2009; Oblinger, 2006; Wilson & Randal, 2012). Further, the physical learning space can influence student engagement and learning outcomes (Brooks, 2010; Brooks, 2012; Dori & Belcher, 2005; Beichner, et al., 2007). In a number of these studies, however, both space and curriculum design were changed in addition to the instructor behavior so it was difficult to know whether space, curriculum redesign or instructor behavior or a combination of those factors influenced the results (e.g., Beichner, et al., 2007; Dori & Belcher, 2005). Additionally, when instructors from a traditional classroom were placed in an ALC, their behavior changed even when the researchers attempted to hold

learning activities constant (Whiteside, Brooks, & Walker, 2010). These results indicate that space can influence instructor behavior as well as instructor and student perceptions of engagement thus underscoring the dynamic relation between space, instructor behavior and student engagement and learning.

The results of these studies also beg the question: what other factors might influence instructor behavior? Prior research shows that instructor knowledge, academic discipline, and individual pedagogy can influence teaching behavior (Savin-Baden, McFarland, & Savin-Baden, 2008). Instructors may choose from a variety of learning activities with these choices likely being driven by the instructor's beliefs and teaching philosophy. One construct of teaching philosophy is the degree to which an instructor's views align with a constructivist approach. A constructivist approach is student-centered and based on the expectation that knowledge is developed or created through experience (Dori & Belcher, 2005). On the other end of the spectrum is the traditionalist approach, described as teacher-centered and based on the expectation that knowledge and skills transmit from instructor to student (Dori & Belcher, 2005). Instructors bring their philosophies into the classroom, which in turn, can influence the types of learning activities that occur in the classroom and, ultimately, influence student engagement and learning. Given this interaction, we sought to examine how teaching philosophy, learning space, and instructor behavior influence perceptions of student engagement. Furthermore, we examined whether space and teaching philosophy have a direct influence on student engagement or whether student engagement is mediated through instructor behavior.

In this study, we used a 1x2 within subjects design with type of space (traditional vs. ALC) as an independent variable to examine instructor behavior and perceptions of student learning and engagement. Forty-five (45) instructors who taught in both traditional and ALCs were given five surveys. We found that instructors perceived that students were significantly more engaged in an ALC than in a traditional classroom. This perception was significantly higher for instructors with a more constructivist philosophy. Specifically, we found that when in a traditional classroom, instructors' teaching philosophies influenced instructors' behavior but not perceptions of student engagement. Conversely, when in the ALC, instructors' teaching philosophies influenced both instructors' behavior and perceptions of student engagement. Finally, we found that instructors' behavior mediates the relationship between teaching philosophy and student engagement.

This study contributes to the existing literature. First, we answer the call for more systematic empirical research. Second, we examine teaching philosophy, which is a factor that may influence the use of active learning strategies, and the effectiveness of ALC in terms of student engagement.

Theory and Hypotheses Development

Active Learning Spaces

Traditional spaces typically use fixed desks that face the front of the classroom where there is a lecture podium. Active learning classrooms use movable work surfaces typically grouped in pods that do not usually face the front of the classroom; they are designed to create more access to technology as well as workspaces that allow for student interaction and often include whiteboards that facilitate group problem-solving and peer-to-peer teaching. These features are provided with the idea that they will enhance student learning and engagement. There have been a number of studies that specifically examined whether the type of learning space does influence student engagement and learning outcomes (Amedeo et al., 2009; Beichner, et al., 2007; Brooks, 2010; Brooks, 2012; Dori & Belcher, 2005; Jankowska, 2007; Lippincot, 2009; Long & Heleton, 2009; Oblinger, 2006; Whiteside et al., 2010; McArthur, 2015). Two of the early projects: the Technology Enabled Active Learning (TEAL) (Dori & Belcher, 2005) and the Student-Centered Active Learning Environments for Undergraduate Programs (SCALE-UP) (Beichner, et al., 2007) changed the physical classroom and redesigned the curriculum at the same time. Along with the curriculum redesign, teaching methodology (instructor behavior) was changed. Where lecture was the predominant instructor behavior in the traditional classroom, a wider variety of teaching strategies was utilized in the ALC, such as problem-based exercises, team-based projects, interactive assignments, and think-pair-share. While the findings of these studies indicate that the type of classroom influenced student learning outcomes (e.g., failure rates) and student satisfaction (e.g., attitudes, attendance) it is difficult to know what was driving the results. Were they due to a change in the learning space, a change in curriculum, or a change in instructor behavior? In the studies that followed, researchers continued to have issues with simultaneous changes in both type of classroom and instructor behavior even when the researchers tried to hold instructor behavior constant (Brooks, 2010; Brooks, 2012; Walker, Brooks, & Baepler, 2011; Whiteside et al., 2010). Furthermore, McArthur (2015) found that space influenced student-learning outcomes and that the instructor moderated the relationship between space and student learning. While the conclusion of these latter studies was that "space matters" to student learning outcomes and engagement, they also suggest that "instructor behavior" might matter too. Thus, is it the type of space that is driving

student engagement and learning or is it the types of learning strategies utilized by the instructor? As a result, our study sought to further examine how physical learning spaces and instructor behavior influence perceptions of student engagement and learning. Therefore, our first two hypotheses were as follows:

H1: Instructors will perceive student engagement and learning to be higher in active learning spaces than in traditional learning spaces.

H2: Instructors will perceive student engagement and learning to be higher when instructors use more active learning strategies than when instructors use more traditional learning strategies.

Teaching Philosophy

Based on the studies mentioned above, instructors behave differently in an ALC than they do in traditional learning spaces. But, was the choice of learning activities (instructor behavior) solely driven by the learning environment or, was the choice of learning activities also driven by the instructors' beliefs and teaching philosophies? Prior research has shown that not all instructors utilize active learning strategies even when in an ALC (Brooks, 2012). As a result, instructor beliefs and teaching philosophy may be a significant determinant of not only what actually happens in the classroom, regardless of the type of space, but ultimately, in student engagement and learning. Teaching philosophy is likely a complex composite of views including beliefs about how individuals learn, the role of the instructor, the role of student, and the area of discipline. We focused on one aspect of teaching philosophy that is characterized as either more student-centered (constructivist) or more teacher-centered (traditional). Teaching philosophy is fundamentally core to the individual, making it difficult for an individual with one orientation to utilize an approach or method from the other orientation (Samuelowicz & Bain, 2001). In other words, an instructor's teaching philosophy tends to be constant across physical domains.

Teaching philosophy can run along a continuum from constructivist to traditionalist. A constructivist philosophy is based on the belief that knowledge is constructed by learners; is not transmitted; the learner is the owner of the knowledge; and the learner is self-directed. In addition, the instructor is responsible for encouraging the learning. Learning occurs through doing, experience and assimilation. Learning is best conceived as a process and not in terms of outcomes; and, finally there is a social interaction aspect of learning (Dori & Belcher, 2005; Duit & Treagust, 1998; Inhelder & Piaget, 1958; Kolb & Kolb, 2005; von Glaserfeld, 1987; Taylor & Kroth, 2009; Vygotsky, 1963; Vygotsky, 1978). Studies supporting the constructivist philosophy have shown that learners are not passive receivers of knowledge, but that knowledge is actively constructed by each learner (Bransford, Brown, & Cocking, 2002). These studies suggest that active, collaborative learning and knowledge creation by students is a more effective model of learning (Honebein, 1996). A constructivist philosophy would lend itself to instructor behavior that included more hands-on activities, experiments, problem-solving cases, simulations, and student centered discussion.

In contrast, the traditionalist teaching philosophy focuses on the following beliefs: knowledge is transmitted from instructor to student; the learner is dependent and reactive; the instructor is fully responsible for content and direction; and the learner acquires information and learning (Dori & Belcher, 2005; Kolb & Kolb, 2005; Taylor & Kroth, 2009). A traditionalist philosophy lends itself to instructor behavior that includes more teacher-centered activities such as lectures and presentations. While the literature makes a bright-line distinction between the constructivist and traditionalist philosophies, it may be better represented as a continuum.

Type of space, instructor behavior and teaching philosophy

In the first two hypotheses, we predicted that the type of space and instructor behavior would have significant effects on student engagement and learning. We examined them independently but it is likely that these factors, along with teaching philosophy, have joint effects on student engagement and learning. Graetz (2006) argued that space fosters the use of collaborative learning activities that in turn affect learners' engagement. In addition, Sawers et al., (2015) found that both type of learning space and teaching philosophy had an impact on the type of learning strategies utilized by instructors. Furthermore, active learning strategies were used more frequently when an instructor had a more constructivist teaching philosophy and was in an ALC. These results indicate that ALCs promote and support forms of active learning that are consistent with a more constructivist philosophy. In other words, instructors who have a more constructivist teaching philosophy might feel freer to use active learning strategies in the ALC, whereas they may have wanted to use such strategies before but felt that a traditional classroom would not accommodate them. Thus, if type of space and teaching philosophy influence instructor behavior, what then is the relation to student engagement and learning? It is likely that type of space and teaching philosophy are mediated by instructor behavior. That is, the type of space and teaching philosophy influence

instructor behavior that in turn influences student engagement and learning. As a result, our last two hypotheses are as follows:

H3: Instructor teaching philosophy and type of learning space will jointly influence instructor perceptions of student learning and engagement.

H4: Instructor teaching philosophy and type of learning space will influence the type of learning activities that occur and in turn influence instructor perceptions of student learning and engagement.

Research Design

We examined our research questions using a 1x2 type of space (traditional vs. ALC) within subjects design. Participants were recruited via email from a group of forty-five instructors who had taught courses in an ALC between September 2011 and December 2012. In order to participate the instructors had to have also taught the same course in a traditional classroom within the 12-month period. The email provided links to a digital consent form along with five surveys. Participation was voluntary and participants received a $25 gift certificate for completing the surveys. Once the consent form was completed, participants could access the surveys via the electronic links. Participants could complete the surveys in any order they desired and did not have to complete all of the surveys at the same time. From the 45 surveys sent out, we received 30 complete responses for a 67% response rate.

The variable measures included teaching philosophy, usage of active learning strategies, and perceptions of student engagement and learning. The data were gathered through five survey instruments. The first survey was a demographic questionnaire (*Instructor Demographics Survey*) that requested information such as gender, level of education, years of teaching experience, prior experience in an ALC, and basic course information (name of course, number of credits, and meeting times). The second survey (*Classroom Utilization Survey-ALC*) asked questions related to teaching activities, instructor perceptions of student learning, and engagement for a class taught in an active learning classroom. This survey was modeled after the STSS Research Project Faculty Survey developed by the University of Minnesota. (See Appendix A for a sample of the survey questions). To assess instructor use of teaching activities, instructors were asked to identify on a scale of 1 (never) to 5 (always) how often they utilized various learning activities. For example, "How often did you lecture for 5-15 minutes?" "How often did you use student led class discussions?" "How often did you use think-pair-share?" "How often did you have the students write on the board/wall?" To assess instructor perceptions of student learning and engagement, instructors were asked to indicate of a scale of 1 (strongly disagree) to 5 (strongly agree) their agreement with statements regarding how the classroom influenced student learning and engagement. For example, "Engages my student in the learning process." "Increases the student's excitement to learn." "Encourages students to actively participate."

The third survey (Short Answer Survey) asked open-ended questions seeking to gain deeper insight into the instructor experience in the active learning classroom (See Appendix B). The fourth survey (*Classroom Teaching Survey*) asked questions about instructor teaching philosophy, measuring the extent to which the instructors' views on teaching align with the constructivist approach. This survey provided a list of philosophical statements about teaching and learning and the instructors were asked to indicate, on a scale of 1 (strongly disagree) to 5 (strongly agree), their level of agreement (See Appendix C). For example, "A good lecture is an effective way to teach college students." "Instructor talk should be kept to a minimum in most classes." Finally, the fifth survey (*Classroom Utilization Survey-Traditional*) asked the same questions as the second survey but for the same course taught in a traditional classroom.

Results

Sample

Thirty instructors, evenly split between males and females (48.3% each), participated in the study. One instructor did not report his or her gender. The majority of the instructors surveyed (86.2%) had never taught in an ALC prior to Spring 2011. A majority of those who completed the surveys (92.9%) hold a doctorate. The number of years the participants had been at their current university ranged from 1 to over 26. Approximately 21% of the participants had been at their current university for at least 21 years.

Variables

Active Learning Strategies (Instructor Behavior)

We used two measures for the use of active learning strategies. The first comes from Section 2 of the *Classroom Utilization Survey,* which listed 32 questions about use of various activities in the classroom. The responses to these questions (e.g. "students participate in a debate") were on a 5-point Likert scale (never, rarely, occasionally, frequently, always). There was also an N/A option in instances where the activity was not applicable to the course. The item responses were then added together to form a score such that

Instrument	Cronbach's Alpha	N of Items
Usage of active learning strategies (raw scores)	.85	32
Instructor's perceptions of student engagement	.96	33
Instructor's teaching philosophy	.91	54

Table 1. Reliability statistics instruments used

a higher score indicated greater use of the active learning strategies. The instrument had Cronbach's Alpha of .85 indicating adequate reliability (Table 1).[1]

The second measure (percent usage) came from Section 3 of the *Classroom Utilization Survey*, which referenced four general activity categories of faculty 1) lecture, 2) faculty-led activities, 3) student activities, and 4) student-led activities. Participants were asked to estimate the percentage of time spent on each of the general activity categories for an average week in the quarter, such that the four general activity categories equaled 100%.

Perceptions of Student Learning and Engagement

The 33 items in section 4 of the *Classroom Utilization Survey* referenced faculty perceptions of the impact of the learning space on student learning and engagement. Responses to these items (e.g. "enriches my students' learning experience") were on a 4-point Likert scale (strongly agree, agree, disagree, strongly disagree). The responses were coded so that greater agreement with a statement indicated greater perceptions of student learning and engagement. For example, a response of "strongly agree" to the statement "engages my students in the learning process" would indicate that the instructor perceived students as being more engaged compared to a "disagree" response. The results of a factor analysis indicated one factor and reported a Cronbach Alpha of .96 suggesting that the items formed one dimension of student engagement (Table 1). The coded responses were, therefore, added together to create one score for perceptions of student engagement. Gall, Borg and Gall (1996) suggested a Cronbach alpha of .80 was adequate for this type of self-report instrument.

Teaching Philosophy

The *Classroom Teaching Survey* consisted of 54 items that referenced teaching philosophy. Responses to these items (e.g. "A key role of the instructor is to facilitate student-to-student discourse") were on a 5-point scale ranging from "strongly agree" to "strongly disagree." The responses were coded so that agreement with the statements indicated closer adherence to constructivist practice. Some questions were reverse coded because agreement indicated inconsistence with constructivist practice. The results of the factor analysis indicated that the items loaded on one factor with a Cronbach Alpha of .91.

Hypotheses tests

H_1: *Instructors will perceive student engagement and learning to be higher in active learning spaces than in traditional learning spaces.*

For hypothesis 1 we compared perceptions of student engagement reported in the traditional classroom with what was reported in the ALC.[2] Based on the results of a repeated measures t test ($t = 2.94$, $p < .01$), it appears that instructors perceived that students were significantly more engaged in an ALC than in a traditional classroom as shown in Table 2. These results support hypothesis 1 and provide further support for findings from prior studies.

H_2: *Instructors will perceive student engagement and learning to be higher when instructors use more active learning strategies than when instructors use more traditional learning strategies.*

To investigate the association between usage of active learning strategies and perception of student engagement the scores from the respective instruments were correlated.

[1] We also created a collapsed score where responses for "rarely" and "occasionally" formed one category, "frequently" and "always" formed one category, and "never" was the final category. The collapsed scores had a Cronbach Alpha of .83 indicating adequate reliability. Results using the collapsed scores were qualitatively similar to using the raw or un-collapsed scores. As a result, we discuss only the results using the raw scores.

[2] In cases where the same participants are used in two different settings, a repeated measures t test is the appropriate procedure to test such a hypothesis.

		M	*N*	*SD*	*t*	r^2
Perceptions of Student Engagement	Active classroom	119.43	28	35.64	2.94**	.24
	Traditional classroom	99.75	28	27.77		

**$p < .01$

Table 2. Comparison of instructors' perceptions of student engagement across settings

The results of the correlation analysis ($r = .62$. $p < .01$, $r^2 = .38$) indicated that greater usage of active learning strategies was associated with perceptions of higher levels of student engagement. These results support hypothesis 2.

H3: *Instructor teaching philosophy and type of learning space will jointly influence instructor perceptions of student learning and engagement.*

Using the median as the cutoff point, two groups of instructors were created – one relatively more constructivist and the other relatively less constructivist. The average (factor scores) perception of student engagement was compared between the two groups in each of the settings using a *t* test. Based on the results of a *t* test, in the ALC instructors with a more constructivist philosophy perceived their students as being more engaged in learning than those instructors whose teaching philosophy was less constructivist (Table 3). However, in the traditional classroom there was insufficient evidence to conclude that teaching philosophy influenced instructor perceptions of student learning and engagement.

We further investigated the relationship between teaching philosophy and perception of student engagement through a correlation analysis. The results of the correlation analysis (results not tabulated) showed a significant positive correlation between constructivism and instructors' perceptions of student engagement in the active classroom ($r = .46$, $p = .01$, $r^2 = .21$). That is, instructors with a relatively more constructivist philosophy tended to perceive students as more engaged in their learning. This relationship, however, was not statistically significant in the traditional classroom. It would therefore appear that the learning space did influence the relationship between the instructor's philosophy and his/her perception of student learning and engagement.

H4: *Instructor teaching philosophy and type of learning space will influence the type of learning activities that occur and in turn influence instructor perceptions of student learning and engagement.*

Figure 1 illustrates our predictions regarding the relationship among teaching philosophy, use of active learning strategies (instructor behavior) and perception of student engagement in each of the classroom settings. The bold arrows indicate a statistically significant correlation between the pair of variables. For example, in the active learning classroom we find there is a significant relationship between teaching philosophy and activities; between activities and student engagement; and between teaching philosophy and student engagement (as reported in Table 4; $F = 7.12$, $p = .01$). The relationship between teaching philosophy and student engagement remained significant ($F = 3.86$, $p = .03$) when the usage of active learning strategies was included in the model. Furthermore, the application of active learning activities appears to moderate the relationship between the teaching philosophy and perceptions of student engagement in the active classroom.

In the traditional classroom we found only one significant relationship, between teaching philosophy and activities. The relationship between philosophy and perception of

	Space		*M*	*t*[1]	r^2
Perception of student engagement	Active	Less constructivist	103.20	3.03**	.25
		More constructivist	138.07		
	Traditional	Less constructivist	95.36	.83	.00
		More constructivist	104.23		

** $p < .01$

Table 3. Comparison of instructors' perceptions of student engagement based on philosophy

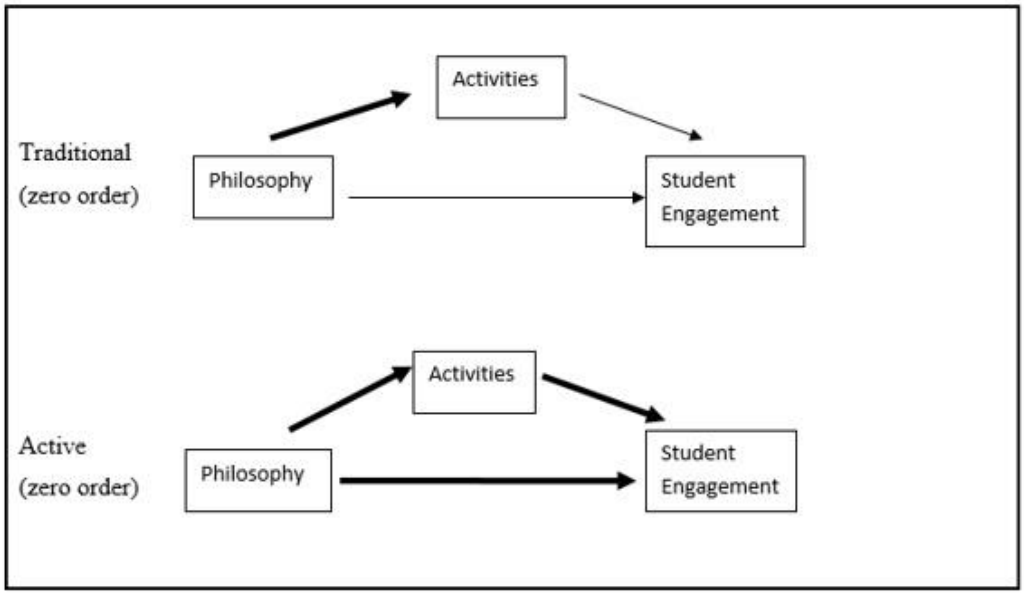

Figure 1. Diagram of relationship among learning space, teaching philosophy, practice, and student engagement

student engagement was not statistically significant (p=.84) and this remained unchanged when the usage of active learning strategies was taken into account (p =.91). Taken together, teaching philosophy influences learning activities in both the traditional and ALC. Learning activities, in turn, influences perceptions of engagement in the ALC but not in the traditional classroom. In other words, teaching philosophy appears to drive behavior but only in the ALC where that behavior influences perceptions of student engagement. Thus, the relationship among the three variables (teaching philosophy, usage of active learning strategies and perceptions of student engagement) appeared to be influenced by the type of learning space. These results support hypothesis 4.

Additional Analysis

While the quantitative results provided support for our hypotheses, we also wanted to obtain additional insight into the variables in question. To accomplish this goal we collected qualitative data by asking nine short open-ended questions regarding the instructors experience in the ALC (See appendix B). An analysis of the qualitative data revealed common themes in support of the findings from the quantitative data. Instructors reported that when in an

			Student Engagement	ANOVA results – F	
Active Classroom	1.	Teaching Philosophy	.29 (.08)	Model 1 (predictor 1)	7.12*
	2.	Usage of Active Learning Strategies	.14 (.02)	Model 2 (predictors 1& 2)	3.86*
Traditional classroom	1.	Teaching Philosophy	.08 (.01)	Model 1 (predictor 1)	.04
	2.	Usage of Active Learning Strategies	-.08 (.01)	Model 2 (predictors 1& 2)	.10

Table 4. Regression analysis by classroom showing semi-partial r (r^2) and F ratio

ALC they lectured less and used active learning strategies more; they increased use of classroom space; and they perceived students as more engaged.

The quantitative results revealed a significantly greater increase in perceptions of student engagement among instructors with a more constructivist teaching philosophy when moving from a traditional classroom to an ALC. This finding implies that either a) more constructivist instructors are better able to use the ALC to support student engagement or b) more constructivist instructors are disposed to perceive increased student engagement in the ALC. Both of these factors may have contributed to the changes in perceived student engagement among the more constructivist instructors.

Survey comments suggest that when instructors made the transition to the ALC, the more constructivist instructors were better prepared to take advantage of the space in order to expand their use of active learning strategies. For example, one instructor described that in the ALC, "the activities changed as we went along - both directed by me and invented by the students." Another instructor said that the ALC "allowed more diverse and prolonged engagement with students interacting with materials and various methods—not merely discourse and discussion." If we assume that the use of active learning strategies will often lead to student engagement then this could, in part, explain the greater increases in perceptions of student engagement among more constructivist instructors.

It is also possible that more constructivist instructors were more disposed to associate increased student engagement with the classroom dynamics that were fostered by the ALC. In our analysis of instructor written responses, we noticed a widespread perception that the ALC compromised the instructor's control and increased the student's control of the learning process. For example, one instructor wrote that the active learning space "forced me to be organized with web-based instructions (that) teams could read on their own and get to work (with) rather than listening to me explain a PowerPoint slide." Interestingly, various instructors described the transfer of control from the instructor to the students both positively and negatively. One instructor expressed concern that she "couldn't keep close contact with students without walking around a lot." She also "had to shout to be heard." Another instructor noticed that in the active learning space it was "difficult to control side conversations." These comments were characteristic of instructors who felt that the ALC interfered negatively with their control of the classroom. In contrast, there were also instructors who described the democratization of classroom control in a very positive light. One instructor described the ALC as "allow(ing) for more interaction within groups and movement." Another instructor asserted that the room itself "seemed to increase (the students') trust in each other's intelligence." We would suggest that the seemingly stark contrast between "side conversations" and "trust in each other's intelligence" might be, in part, in the eye of the beholder. Perhaps instructors who expected the students to play an active role in the construction of knowledge were also more likely to view increased student control of the learning process positively. This orientation may also explain why more constructivist instructors are more likely to associate increased student control with greater student engagement. As a result, it appears that more constructivist-learning instructors are both better able to use the ALC to support student engagement and more disposed to perceive increased student engagement in the ALC because they see more student control as a sign of positive engagement.

Conclusion

Our study contributes to the question of why space affects learning in a number of ways. First, we answered the call for more systematic empirical research. Second, we examined how teaching philosophy and instructor behavior influence perceptions of student engagement, which are rarely examined. Further, we examined teaching philosophy and learning spaces together to better understand how the two interact to influence instructor behavior and instructor perceptions of student engagement and learning. Finally, our study may provide insight into the efficacy of space design as well as faculty development. For example, if space has a greater impact on student engagement when used by faculty who have a more constructivist philosophy, then focusing development around understanding and building appreciation for a more constructivist teaching philosophy may be more effective. It may also lead to greater acceptance and utilization of active learning strategies and utilization of the ALCs features than simply focusing on active learning strategies alone.

As with any quasi-experimental study, there are limitations. We measured instructors' self-reported use of active learning strategies and perceptions of student learning and engagement via surveys. A more direct measure would be to observe instructor behavior in the classroom but even this has limitations. Because we used a within subjects design, which compared the same instructor's perceptions in two different classrooms, we reduced and controlled for self-report bias and inaccurate perceptions that might be found when comparing two different instructors' perceptions in two different classrooms. Thus, our research design mitigates some of the limitations of using surveys. Further, the survey instrument

that we used has been validated in a number of prior studies (Brooks, 2010; Brooks, 2012; Walker, Brooks & Baepler, 2011; Whiteside et al., 2010) and our own factor analysis adds to its validity.

The limitations of this study point to a need for further research that uses more direct measures of instructor behavior, student learning, and engagement. What happens in the classroom is dynamic and complex; this paper examines only a few of those dynamic factors. Future research could continue to identify the complex relationships and examine how the factors influence each other to create student learning and engagement.

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Appendix A
Classroom Utilization Survey – ALC
Sample Questions

For this set of questions, please estimate how often you used the following teachings activities when you taught this class in an ALC. If an activity is not applicable to your particular course, mark N/A. If an activity may be applicable to your course but you do not employ that activity, mark Never. (Scale: Never, Rarely, Occasionally, Frequently, Always, N/A)

- Briefly review key concepts
- Lecture 5-15 minutes
- Lecture 20-35 minutes
- Consult with students
- Faculty led class discussion
- Student led class discussion
- Think-pair-share
- Students work in collaborative learning groups or teams
- Instructor demonstrates exercises/problems
- Students conduct an experiment
- Students write on the board/wall

For the next set of questions, please indicate whether you Strongly Agree, Agree, Disagree, or Strongly Disagree with the following statements. (If you do not know the answer to a question, please leave that question blank and go on to the next one): The ALC…

- Increases my students' excitement to learn
- Facilitates multiple types of learning activities
- Enriches my learning experience
- Promotes discussion amount students
- Makes students want to attend class regularly
- Enables my students to locate and critically evaluate information
- Engages my students in the learning process
- Helps me make connections with my students
- Helps my students to examine how others gather and interpret data assess the soundness of their conclusions
- Helps my students to grow comfortable working with people from other cultures
- Encourages my students to create or generate new ideas, products, or want of understanding

Appendix B
Short Answer Survey

1. How did the classroom influence your behavior and/or instructional practices? Please describe.
2. Of the practices that you changed, had you planned the changes before you began the quarter or did they evolve as you became more familiar with the classroom? Please describe.
3. How did you (instructor) feel about the physical layout of the classroom? Did it impact how you interacted with students? Please describe.
4. Did the classroom influence the behavior and/or learning of the students? Please describe.
5. Please describe one particular activity which was supported by the active learning classroom. Try to describe specific ways in which the classroom supported student engagement with this particular activity.
6. Please describe one situation in which this room did not work well for you. Provide as much detail as possible.
7. What are your overall thoughts about the classroom?
8. What would have helped you to be more comfortable and/or effective in this classroom?
9. Other comments?

Appendix C
Classroom Teaching Survey
Sample Questions

Following are a number of philosophical statements about teaching and learning. Please respond to them from your own perspective. There is no sense of "appropriate" answers implied. (Scale: Strongly Agree, Agree, Neither Agree nor Disagree, Disagree, Strongly Disagree)

- Lecturing is an effective way to teach college students.
- Academic subjects should be taught in an integrated fashion.
- An important task of the instructor is to motivate students.
- Typically, students do not possess the knowledge needed to discuss ideas in depth.
- Students learn when they attend carefully to the ideas and information that are presented by the professor.
- The student's role in learning should be active and initiatory.
- Students should play a vital role in planning the course of study.
- The professor should be the primary source of knowledge and disciplinary expertise.
- Cooperative learning and group projects should predominate.
- Students are naturally curious and genuinely want to learn.
- The instructor's role is to coach and facilitate learning.
- An important instructor role is to monitor and assess student learning.