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The Room Itself Is Active: How Classroom Design Impacts Student Engagement

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A responsive case study evaluation approach utilizing interviews and focus groups collected student and faculty perspectives on examined how instructors and students utilized a newly redesigned active learning space at Iowa State University and the relationship of this design with environmental and behavioral factors of student engagement. The findings demonstrate how classroom design affords engagement through low-cost learning tools and a flexible, open, student-centered space afforded a variety of active learning strategies. In addition, this case study highlights the importance of conducting assessment on classroom redesign initiatives to justify and improve future classroom spaces.

In the years since Chickering and Gamson's (1987) influential article *Seven Principles for Good Practice in Undergraduate Education*, active learning has become an integral part of the student learning experience (Kuh, Kinzie, Schuh, Whitt & Assoc., 2010). Changes in student expectations and attitudes, as well as research demonstrating the relationship between active engagement and student learning (Prince, 2004), have challenged institutions to reconsider their design of classroom spaces (Oblinger, 2006). The "traditional" college classroom, with a fixed, lecture-style configuration, does not match what we know about how students learn nor how students expect to learn (Oblinger). As result, many colleges and universities around the country are committing resources to redesign classroom spaces to promote active, participatory, experiential learning (Harvey & Kenyon, 2013).

Iowa State University (ISU) recently devoted resources from three campus departments (Center for Excellence in Teaching and Learning, Facilities Planning and Management, and Instructional Technology Services) to transform one classroom into an active learning classroom (Rosacker, 2012). Although institutions have been working to redesign their classroom spaces (Educause, 2010) few institutions are engaging in assessment processes that evaluate if the purposes of these redesigns are achieved.

The purpose of this qualitative case study was to investigate how an active learning classroom (ALC) at ISU influenced student engagement. Using Barkley's (2010) classroom-based model of student engagement, the findings provide insights on how classroom design affords student

engagement and offer suggestions for improving the redesign and implementation of active learning classrooms. In addition, this case study highlights the importance of conducting assessment on classroom redesign initiatives.

Review of Literature

To better understand this study, this section provides a definition of active learning and highlights research on the relationship between classroom spaces and student engagement.

Active Learning

Bonwell and Eison (1991) defined active learning as any learning strategy that involves "students doing things, and thinking about the things they are doing" (p. 2). Characteristics of active learning strategies include: students are involved in more than listening, are encouraged to share thoughts and values, and are asked to engage in higher-order thinking such as analysis and synthesis rather than memorization (Bonwell & Eison). Instructional strategies that promote active learning include small group discussion, peer questioning, cooperative learning, problem-based learning, simulations, journal writing, and case-study teaching, among others (Barkley, 2010; Prince, 2004). Edgerton (1997) refers to active learning strategies as "pedagogies of engagement" (p. 36); practices that encourage greater understanding and transfer of knowledge.

Meta analyses of research studies from the learning sciences and educational psychology have demonstrated that active learning approaches, in comparison to more passive, teaching-center approaches, lead to greater engagement that subsequently lead to increased student learning (see, for example: Freeman et al., 2014; Hake, 1997; Michael, 2006; Prince, 2004). Because classroom design is a

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significant factor that can either hinder or promote this engagement, this study examined the relationship of classroom design and engagement.

Classroom Space and its Effect on Engagement

Mohanani (2002; 2000) refers to classroom design as “built pedagogy”, or the design of the classroom space is a physical manifestation of educational theories, philosophies, and values. He states, “Given the premise that built environments enable and constrain certain modes of social action and interaction, educational structures embody curricula and values by design (2000; p. 1).”

Within a classroom design, constructs known as affordances are created that enable or constrain engagement. An affordance refers to the perceived and actual properties of objects or environments that determine how the object or environment could be used (Gibson, 1979; Norman, 2002). Affordances are resources within an environment to those who perceive and use them (Norman). For example, movable chairs afford students the ability to group closer together for collaborative work or discussion. Within the context of this study, it is assumed that the designed, physical environment of the ALC provides affordances for learning behaviors and pedagogical practices that support student engagement in the learning process.

Previous research has investigated classroom design and its relationship with student learning, including the effect of open learning spaces (Barber, 2006; Graetz & Goliber, 2002; Hunley and Schaller, 2006), flexible seating and writing surfaces (Lombardi and Wall, 2006; Sanders, 2013), the integration of technological learning tools (Brewer, Kramer, & O'Brien, 2009; Educause, 2012; Sidall, 2006; Whiteside & Fitzgerald, 2005), lighting (Sleeters, Molenaar, Galetzka, &

van der Zanden, 2012), and aesthetics (Janowska & Atlay, 2007). The richness of studies such as these illustrate how classroom affordances can positively support classroom practices by enhancing student engagement in the learning process.

Through the lens of a classroom-based model of student engagement in one redesigned active learning classroom at ISU, this study contributes to the literature by providing understanding of how the designed environment affords learning behaviors and teaching practices that promote student engagement in learning.

Theoretical Framework

Barkley's (2010) classroom-based model of student engagement provides the theoretical framework for this study. Barkley defines student engagement as “a process and a product that is experienced on a continuum and results from the synergistic interaction between motivation and active learning” (p. 8). Barkley states classrooms environments create synergy between active learning and motivation by (a) “creating a sense of classroom community”, (b) “helping students work at their optimal level of challenge”, and (c) “teaching so that students learn holistically” (pp. 24-38). Therefore, attention was paid to how the classroom design affords behaviors and conditions that promote student engagement.

Methods

This qualitative case study assessment is a theoretically-based, utilization-focused cross-sectional design that collected data on classroom use and perceived effectiveness (Fitzpatrick, Sanders, & Worthen, 2011). The study was approved by the Institutional Review Board.



Figure 1: ALC Before and After. ALC prior to redesign (left) and after (right). In the redesigned classroom image, the movable chairs are arranged in small group format; portable white boards are placed on the chairs to be used as table tops for small group work. Copyright 2014 Iowa State University. Reprinted with permission.



Figure 2: Three Views of ALC. Three views of the redesigned ALC. Left image: the classroom in small group format, from front of the room. Middle image: small group format from the rear of the room. Right image: row seating format from the front of the room. Copyright 2014 Iowa State University. Reprinted with permission.

The study focused on a classroom at ISU that was redesigned from a 'traditional' classroom, with a fixed seating configuration and no classroom technology, into to a flexible layout and seating configurations and added technology to enhance student learning. The ALC was designed specifically for active, collaborative learning including portable white boards, supplemental computer monitors, and flexible seating to accommodate small group, large group, and individual work. The classroom has a maximum capacity of 36 students. Figure 1 shows the classroom before and after redesign, and Figure 2 shows three views of the new ALC.

Participants

Faculty and students who had taught or taken at least one course in the ALC in spring 2013, fall 2013 and/or spring 2014 semesters were participants. Four instructors and nine students participated in the study. Although the sample size was small, the participants represented a variety of disciplines which allowed for maximum variation: the goal was to identify common patterns among diverse classroom experiences (Marshall & Rossman, 1999).

Data Collection

Data was collected via focus groups. The social, semi-public nature of a focus group method allowed for multiple views and perspectives aimed at gaining insight into the attitudes, feelings, and beliefs of classroom users (Morgan, 1998). All participants were offered the opportunity for private interviews in lieu of participating in focus groups; one faculty member opted for an individual interview for this reason.

Data from faculty members were collected in one focus group and one individual interview. Faculty were asked

semi-structured interview questions regarding their interactions with students, to reflect upon specific examples of incorporating the physical attributes of the classroom in their lessons, and their perceptions on students' engagement. Data were collected from students via three focus groups. Students were asked semi-structured questions regarding their interaction with others, with the physical and technological attributes of the classroom, and their perceptions of their own motivation and engagement. All focus groups and interviews were recorded and transcribed for analysis.

Data Analysis

Data from the transcripts were analyzed using a two-cycle method of coding and analysis (Saldaña, 2009). In the first phase, descriptive codes were used to highlight concepts or contents representing references to active learning and motivation, reflection, and self-monitoring of learning; attribute codes were used to identify data relating to attributes of the classroom design, and descriptive codes identified the affordances the space provided. Value codes highlighted participants' descriptions of participants' values, attitudes, and beliefs (Saldaña). In the second phase, clusters of data were formed around Barkley's (2010) description of classroom conditions that promote student engagement; these clusters included the descriptive, attribute, and value codes.

Multiple strategies were used to ensure goodness and trustworthiness (Merriam, 2002). Participants reviewed focus group and interview transcripts to ensure the participants' thoughts and beliefs were adequately captured (Merriam). Analytic memos and other documentation were kept as an account of the methodological procedures (Saldaña, 2009). Finally, descriptions of context and participant narratives provide illustrations of the themes for

the reader to consider transferability to other contexts (Merriam).

Results

The purpose of this study was to examine how the physical design of the ALC impacted student engagement. Three themes emerged: (a) the classroom design created a community of learners, (b) classroom design helped students work at their optimal level of challenge, and (c) classroom design helped students to learn holistically.

Classroom Design Creates a Community of Learners

The ALC is a flexible, open classroom design; student seating is not fixed, and there are no stationary tables or work spaces. These features afforded the classroom space to be adapted to support different instructional strategies. Participants reported the flexibility of the design affords for students and instructors to move around the classroom enabling social interaction and collaboration. Students felt that the classroom design “erased the line” between instructors and students which encouraged interaction and led students to feel closer personal connections with their instructor and their peers, creating a sense of community and enhancing student engagement.

Open Space Affords Movement and Interaction. The flexible, open design of the ALC afforded student and instructor movement, and intellectual and social interaction, in the classroom. The mobile chairs/desks enabled students to interact with other students in order to ask questions and clear up misunderstandings. A student said, “Even if our group didn't know [the answer to a question], we would like swing around and join up with another group ... that really helped, being able to open up a connection.” A faculty member illustrated how she felt the movable chairs in the ALC helped students “hear each other” more. She continued:

These people will be here and these folks, and they're all talking about the same thing, but these folks will hear [the discussion] and kind of respond to it because they're close ... there's this moment when [the knowledge] moved across the room which is very exciting” ... everything about this room really enabled that kind of outcome.

“Erasing the Line” Affords Distributed Knowledge. Classroom design made students feel valued as co-constructors of knowledge, due to the design of the ALC “erasing the line” between students and instructors. “The line” in traditional classrooms was described as “the separation between students and teacher; a solid line between where they stand and you sit.” The design of the ALC removed the dedicated instructor space at the front of the room encouraging social interaction between instructors

and students. The “line” was also described as a psychological separation between themselves and their instructors; removing this line resulted in an environment where students felt respected and valued.

Instructors mentioned they felt they moved around the classroom and engaged in discussions with students more frequently in the ALC as compared to other traditional classrooms. Students also stated their instructors often moved freely around the classroom, allowing them direct contact with their instructors. A student said he felt the frequent movement by the instructor around the classroom collectively increased the engagement of his classmates by making them feel more comfortable and active. “Something about [the design] makes everybody, probably the students and professor, more comfortable and able to really engage with what's going on in the classroom,” he said.

Students felt that the frequent student-faculty interaction in the ALC made them feel valued. A student compared his instructor's approach in the ALC as more as a facilitator of student learning than an instructor:

In [the ALC], where everything is flat, and open, and spread out uniformly, the focus is distributed across the entire classroom across all of the students and instructor, this professor is one of us. He's there because he's trying to facilitate our learning.

A faculty member for whom “building community of learners” was a learning outcome, stated the flexibility of the room's design supported this outcome by allowing everyone, instructors and students, to move freely and engage with diverse others. This instructor felt the level to which this outcome had been reached was higher for his class in the ALC than in other classrooms in which he had previously taught the course.

In summary, the flexible, open design of the ALC allowed for movement within the classroom, encouraging social interaction among peers and students and instructors. Participants reported that frequent social interaction enabled students to connect with each other and their instructor to share, distribute, and co-construct knowledge, resulting in a feeling of community and engagement.

Classroom Design Helps Students Work at their Optimal Level of Challenge

Various audiovisual tools in the ALC increased engagement by helping students to work at their optimal level of challenge. Tools such as portable white boards, Apple TV, LCD panel video projectors, the large writing surface, and flat panel monitors placed around the classroom afforded frequent assessment of students' understanding and for students to create and share knowledge. Students could measure and monitor their own

learning increasing their engagement in the learning process.

Tools Afford Assessing for Understanding. Faculty stated they frequently used the audiovisual tools in the room to check for students' understanding. Faculty members reported they used the portable white boards in the ALC for "report backs" from application activities. One student mentioned the use of the white boards for small group reporting in his course, remarking the boards increased the ease and speed of being able to report back to the instructor or class. "We would all be given the same problem. The groups afterward would compare answers, talk about how we got there...and use [the portable white board] to post our answer," he said. A faculty member also spoke about using the monitors placed around the room for assessment; students would text in responses to a question and the instructor would present the answers in word cloud as a classroom assessment technique. Participants stated the audio visual tools facilitated rapid, frequent assessment of understanding to students could measure and monitor their own learning.

Tools Afford Visualizing Thinking. The incorporation of audiovisual tools also allowed for students to make their thinking and ideas visible to the instructor and their peers. One student illustrated how the portable white boards helped make their understanding visible to peers and provided a large workspace for working through ideas, making revisions, and visually demonstrating a hierarchy of information. Students also stated that being able to see information presented in multiple ways through the audiovisual tools helped them retain information. "You see it at least three times [in three different ways], so that helps it stay in your head," one student stated.

Participants commented on how graphically organizing information with the audiovisual tools helped them to monitor their own learning. A faculty member felt that the portable white boards helped promote higher order thinking skills in her course by integrating writing with group discussion. One student stated her working group moved to the ALC when it was not occupied specifically to use the white boards to study for another course. Diagramming and writing out the various systems she needed to understand for her course on separate, portable white boards and organizing the them along the wall helped her and her classmates fully understand the content at a deeper level: "[My course] is very complicated so it'd be nice to draw things out... it was nice to have the knowledge of knowing a place on campus that we can do something like that and really utilize [it]".

The audiovisual tools in the ALC allowed faculty to assess student knowledge to check for understanding. The tools also encouraged students to share their knowledge with

their peers, co-create knowledge together, or monitor their own understanding. Participants felt audiovisual tools available in the ALC to promoted active and engaged learning.

Classroom Design Encourages Students to Learn Holistically

Participants frequently commented on how the ALC's design was "active" in the sense that it engaged the mind and the body in learning. Many participants felt they were physically active in the ALC; instructors felt they moved around the room more, students moved to collaborate with each other or demonstrate understanding. The learning tools in the ALC allowed for pedagogical options to engage students in many kinds of active learning strategies. Together, these conditions allowed for faculty to holistically engage students in learning.

Design Affords Integrated Learning. Both faculty and students provided accounts of kinesthetic experiences of learning in the ALC. One student commented on how the mobility of the chairs enabled innovative instructional strategies that involved moving the whole class. "There was one day [the instructor] did a debate...we pushed the chairs away and stood up, and actually straight-up divided the classroom." One instructor discussed an activity where he had the class "step into the circle" to demonstrate their understanding. "I used the entire room. I don't want them sitting. I love the space to be able to push chairs out...and just, the use of space." He felt allowing them to move freely around the room to help students understand a concept at a deeper level by engaging their body as well as their mind. Another faculty member illustrated how she felt her class, which was predominantly male, was able to stay engaged because they could move. "I actually think that that was helping them focus because they didn't have to keep themselves constricted...by being able to physically relax in that way, they actually were very focused."

Design Affords Pedagogical Options. Instructors spoke of their desire to integrate more modes of content delivery and active learning strategies into their courses due to the open design and learning tools in the ALC. Faculty collectively brainstormed how the audiovisual features in the ALC could be used and expressed a desire to add more visuals into their teaching to increase engagement and support active learning. Students also commented that the ALC helped them stay engaged by envisioning ways they could use the classroom to aid their own learning. One student said "every time I walk into that room it's always something new." He then went on to explain how his vision for "connected learning" in mathematics was based on the learning tools available in the ALC.

Despite the positive feedback on the ALC, some faculty and staff found the classroom disorienting or distracting. Some students noted that because of the mobility of the chairs in the classroom was often “messy” or disorganized. One student stated that the lack of uniformity in the design was distracting. One faculty member commented that she couldn’t envision ways the monitors could be used to engage students in her class; others felt they weren’t “tech savvy” enough to use them. Although there were a few descriptions of how the design of the ALC could distract students, the participants overwhelmingly felt the ALC contributed to student engagement.

Discussion

The findings of this study illustrate the classroom design created affordances which support learning behaviors and pedagogical practices for student engagement. Flexibility and openness were key attributes in promoting a community of learners, and allowing students to learn holistically, encouraging student engagement in learning. Removing the spatial barrier between faculty and student space was an important classroom attribute that promoted student-faculty interaction and a place where students felt they were co-constructors of knowledge. This finding connects to previous assertions that active learning spaces require more accountability for learning by students due to the few physical barriers between them and their instructors (Cotner, Loper, Walker, & Brooks, 2013; Hunley & Schaller, 2006). Participants also frequently commented on how mobile they were during their classes; this mobility assisted in creating community and keeping class active and dynamic. Encouraging the movement of the instructor and students through the space to promote faculty-student and peer-to-peer interaction influences student engagement.

The study also found that audiovisual tools helped students process information, offered multiple opportunities to revisit content in different modes, and allowed for instructors to assess students understanding and for students to monitor their own learning. Previous research has shown that the addition of technology and other visual tools in the classroom affords a greater sense of engagement, and are integral to understanding of content (Brewer, Kramer, & O’Brien, 2009; Whiteside & Fitzgerald, 2005), which leads to higher student achievement (Educause, 2010). Students retain more information if they are using multiple senses to process information (Barkley, 2010). An important finding in this study is that the lower-cost features, such as portable whiteboards and movable chairs, appeared to provide the greatest affordances for learning and student engagement; this finding is also supported by previous studies in other learning contexts (Brewer et al, 2009; Wise & Soneral as cited in Matthes, 2015).

Previous research has identified that the physical learning space affects a faculty member’s choice of pedagogical options (Hunley & Schaller, 2006; Educause, 2010). The results of this study also found this to be true. The flexible classroom space facilitated the use of various student engagement techniques and also inspired instructors and students with an array of pedagogical choices. Given the importance of flexibility in classroom design, existing and future classroom spaces could be evaluated through the flexible properties of the space (Mohan, 2002).

Implications for Classroom Design

The results of this study demonstrate various ways the physical attributes of a classroom create affordances that promote student engagement. Mobile chairs afforded movement, facilitating interpersonal communication and collaboration between students. Portable whiteboards afforded group work and allowed for rapid assessment of understanding. These two features are low-cost, feasible additions to existing classrooms without requiring substantial physical redesign of the interior space. The additional monitors afforded increased visibility but were not utilized due to assumptions made about user’s access to and comfort with the technology. Due to their high cost, it is recommended that classroom planners carefully consider the addition of monitors to future classroom re-designs.

Removal of the spatial barrier between instructors and students in the ALC’s design afforded student-faculty interaction and motivated students to learn. Future designs that locate the instructor space within the environment help to increase student accountability and agency. Flexible spaces that are adaptable to a variety of instructional strategies and approaches afforded the use of active learning strategies, while the various learning tools available in the classroom inspire instructors, and their students, with an array of pedagogical choices. However, it is recommended that training on classroom technology and active learning strategies are offered in conjunction with the physical re-design of classroom spaces. These findings offer suggestions for improving the redesign and implementation of future active learning classrooms.

Implications for Assessing ALCs

This case study outlines an assessment of an ALC’s that produced valuable data to support current and future classroom redesign. Although the small number of participants limits the generalizability of the findings to broader contexts, this small scale assessment provides important insights into the role of ALCs in promoting student engagement. Future assessments that incorporate more faculty and students may allow for a more nuanced

view of this phenomenon. Similarly, assessments could evaluate how the influence of various strategies on subpopulations of faculty and staff (i.e. gender, ethnicity, academic ability) and could also include a focus on discipline-specific contexts and/or content knowledge.

Future assessments can also focus on direct measures of student learning and performance by comparing students in an ALC classroom with students in “traditional” classrooms. These more complicated and time intensive inquiries can add value to our understanding of ALC classrooms and other learning spaces.

Despite its limitations, this assessment highlights the value of collecting data from students and faculty members who use the space and demonstrates that relatively simple assessments can provide useful information for classroom redesign and can further our understanding of the relationship between learning spaces and student learning and engagement.

Conclusion

Current educational research has demonstrated the importance of active learning methods in improving student engagement and learning. This assessment provided evidence that one approach - redesigning classrooms into ALCs - can enhance student engagement. The study illustrates how making the room active promotes student activity and engagement. As importantly, the process demonstrates a feasible assessment approach for gathering data that can be used to understand the impact of ALCs on learning engagement. Results can be used to both justify the time and resources spent on such activities as well as promote the institution as an environment where learning is valued.

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