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The Interdependence of Learning Theory, Pedagogy, and Spaces

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ABSTRACT

This study addressed the general research question: “Does a flexible learning environment affect student engagement?” During the spring semester of 2007, students and faculty in a prototype learning studio were given questionnaires consisting of items related to learning styles, the manipulation of the learning environment, and student engagement. Qualitative data was collected from selected students in the study. Results suggest that, although a flexible learning environment may not create student engagement, it does support both student engagement and interactive teaching styles. In addition, the data revealed that careful consideration of room size and furniture styles is essential in creating a flexible space that can easily and quickly be reconfigured. [Scholarship of Teaching and Learning (SoTL) project funded by The Maricopa Institute for Learning]

The Interdependence of Learning Theory, Pedagogy, and Spaces

Colleges and universities across the nation are urgently searching for ways to meet the expectations of the diverse students who demand to be actively involved in their learning and are challenging our educational institutions to “Engage me or enrage me” (Prensky, 2005). Student success depends on the degree to which students are engaged in their learning, and effective teaching and learning strategies are being promoted on campuses throughout the country (Bain, 2004). Simultaneously, educators are addressing the need for creating learning spaces that support this participatory and active educational experience (Herman Miller Inc, 2007).

In 2004, a \$951 million bond was passed by voters of Maricopa County for the renovation and new construction of facilities throughout the Maricopa Community College District. Estrella Mountain Community College (EMCC) experimented with prototype learning studios before building a facility for 22 learning studios. These learning studios reflect the concept of “radical flexibility” allowing faculty and students the freedom to “customize the learning environment to the teaching and learning pedagogy, delivery system and technology needs on demand” (Lopez, Yohe, & Gee, 2006, Project section, para. 3). During the spring of 2006, EMCC in partnership with Herman Miller Inc conducted an extensive study comparing these 22 learning studios with traditional classrooms. (For survey and results see <http://www.estrellamountain.edu/awareness/studio.asp>).

Also in anticipation of the bond planning, adjoining rooms at Paradise Valley Community College (PVCC) were renovated into two prototype learning studios giving faculty and students the opportunity to experiment with a flexible learning environment similar to

EMCC's. In the spring semester of 2007, PVCC offered 24 classes in these prototype learning studios, including two classes that I teach. This MIL project gave me the opportunity to create an assessment model for the two PVCC prototype learning studios in order to analyze the impact of flexible space on student engagement, which will assist PVCC in making decisions about the design and renovation of future learning spaces on campus.

Learning Theory, Pedagogy, and Spaces

A review of literature published during the last five years includes two notable journals that focus on the impact of learning spaces in the 21st century: *The Importance of Physical Space in Creating Supportive Learning Environments* (Chism & Bickford, 2002), a *New Directions for Teaching and Learning* volume and *Learning Spaces* (Oblinger, 2006), an Educause e-book. Both resources explore the focus of my project: the interdependence of learning theory, pedagogies, and spaces.

The field of learning pedagogy relies heavily on theories about how we learn. For example, recent developments in cognitive psychology and brain theory suggest that learning is increased by engaging the student at all levels of his construction of knowledge (Bransford, Brown, & Cocking, 1999; Chism, 2002; Zull, 2002; Dede, 2005) supporting a shift in learning pedagogy and a subsequent change in the design of learning environments. Like so many other institutions of higher education across the country, most of our classrooms are traditional—tables and chairs in rows facing the front—designed to support the “transmission theory of learning” emphasizing a “teaching as telling” pedagogy (Bransford et al., 1999; Chism, 2002).

However, the Millennium Generation (born 1981-1994, also known as the Net Gen) is bringing to our campuses a unique attitude towards learning and a skill set requiring pedagogies

that engage them at all levels of their construction of knowledge (Dede, 2005; Prensky, 2005). These students prefer to learn by doing through “active, participatory, experiential learning” (Oblinger, 2006) and by reflecting in an environment that encourages socialization and collaboration (Dede, 2005; Campbell, Dziuban, & Hartman, 2006). The “constructivist theory of learning” shifts the teacher’s role from telling to facilitating. This approach to learning builds on a learner’s previous experience and knowledge and involves the active construction of new knowledge (Chism, 2002; Huitt, 2003; Dede, 2005). Because of this emphasis on student engagement, “learning space needs are seen to be far more dynamic and situational than they were under the transmission model” (Chism, 2002, p. 10).

Student Engagement

Chism asserts that “we can facilitate deeper and richer learning when we design spaces with learning in mind” (2006, p. 2.1). Research in environmental psychology also reveals that “the physical characteristics of learning environments can affect learners emotionally, with important cognitive and behavioral consequences” (Graetz, 2006, p.6.2). For example, a positive emotional response to an environment enhances student learning (Chism, 2006; Graetz, 2006). Indeed, a strong correlation exists between student success and environment (Tinto, 2002; Kuh et al., 2005) and between student success and student engagement (Community College Survey of Student Engagement [CCSSE], 2006).

In order to assess student engagement at community colleges across the nation, the CCSSE project at the University of Texas at Austin has identified 5 benchmarks that define student engagement: active and collaborative learning, student effort, academic challenge, student-faculty interaction, and support for learners (See www.CCSSE.org for extensive

research on the development of the survey). In all of their research, CCSSE emphasizes the need to base every decision an institution makes on a “culture of evidence” (2006). To that end, this study was designed to examine how a flexible learning environment, i.e. a learning studio, affects student engagement.

Methodology

Participants

Of the 24 classes held in the learning studios during the spring of 2007, 13 were selected to participate in the study (those not included were ESL classes). Three classes held in traditional classrooms, taught by instructors teaching the same classes in the learning studio, were also selected for comparison. The students and teachers from these 16 classes were asked to complete an anonymous questionnaire and, therefore, are not personally identifiable.

Quantitative Measures

Three different questionnaires, adapted from EMCC’s Learning Studios Questionnaire (2006) and from the CCSSE Course Feedback Survey (n.d.), served as a means of addressing the research question. The questionnaires consisted of sections related to teaching and learning styles, the manipulation of the learning environment, and student engagement.

Questionnaire A was given to 84 students in selected classes taught by teachers who taught the same course in both a traditional classroom and a learning studio environment: 44 students from 3 classes held in traditional classrooms; 40 students from 3 classes held in a learning studio.

Questionnaire B was given to the other 99 students taking classes held in the learning studios.

Questionnaire C was given to 12 teachers who taught in the learning studios.

Qualitative Measures

Qualitative data was collected only from my two classes. Throughout the semester, students were asked to reflect on their reactions to and experiences in the learning studio. In addition, two students were interviewed by an objective interviewer for an anecdotal inquiry into personal experience in the learning studio (Appendix). Early in the semester, these students complied with traditional human subjects' practices by signing an information consent release. All students completed two open-ended questions on the questionnaires. There was not enough student commitment to participate in the focus groups that were a part of my initial study.

Results

Results from Questionnaire A: (3 learning studio classes versus 3 traditional classes)

The quantitative data revealed no statistically significant differences in student engagement between those students taught in a traditional classroom and those taught in a learning studio. The only notable data revealed that students in the learning studio felt freer to manipulate the furniture to accommodate a learning activity than did those in a traditional classroom (Appendix).

Results from Questionnaire B: (99 students in the learning studio)

Students were asked a series of questions related to the 5 benchmarks of student engagement used in CCSSE surveys. Of those students who did not select "equally in both environments," 28-36% of the students selected the learning studio as the environment in which

they are most likely to participate in activities related to increased student engagement: receiving feedback (Figure 1) and increased interaction (Figure 3). On the other hand, the differences were negligible between the traditional classrooms and the learning studio as the preferred environment for asking questions and making contributions during class (Figure 2) and spending time on task (Figure 4).

Figure 1

☞ *Receive more feedback from peers and faculty*

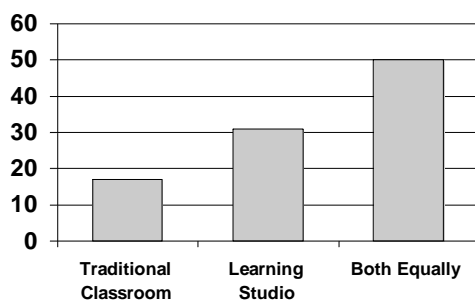


Figure 2

☞ *Ask more questions or contribute more to class discussions*

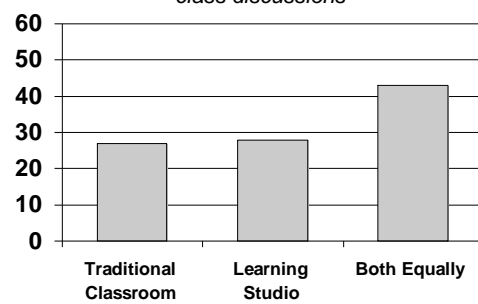


Figure 3

☞ *Interact more with instructors and peers*

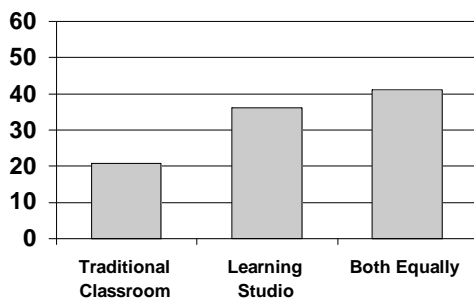
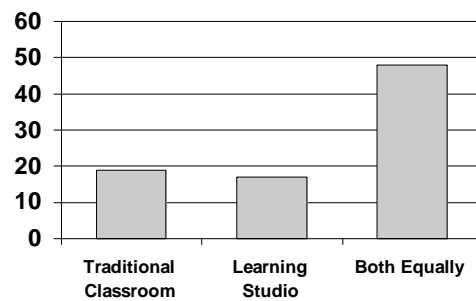


Figure 4

☞ *Spend more time on task*



Results from Questionnaire C: (12 teachers)

Teachers used a variety of teaching styles in the learning studio (Table 1). Overall, teachers agreed that, except for lecturing, the learning studio enhanced their use of these teaching styles.

Table 1

Percentage of time teaching styles were used in the Learning Studio

	Percentage of time used
Lecturing	<i>Average 23%</i>
Providing instructional stimuli and facilitating discovery	<i>Average 19%</i>
Creating a forum for open and free student/teacher dialogue	<i>Average 18%</i>
Fostering interdependence through break-out group activity	<i>Average 18%</i>
Teaching students to take learning into their own hands	<i>Average 13%</i>

Additional responses from the teachers indicated that 75% liked the learning studio, and 92% found it comfortable, attractive, and suitably met their needs. Even though 75% agreed that it was important to be able to reconfigure the studio to support the way they teach, only 50% reconfigured it often. When asked to identify the biggest limitations to being able to manipulate the space, 50% indicated time and 42% indicated the size of the room [too small].

Figures 5-8 represent a comparison between teacher and student responses to a series of statements in which they were asked to select the environment that best provided a professional environment (Figure 5), encouraged self-direction (Figure 6), reflected freedom (Figure 7), and fostered interaction (Figure 8). For each statement, the percentage of teachers who selected learning studios as the preferred environment was higher than the percentage of students.

Figure 5

Provide a more professional environment

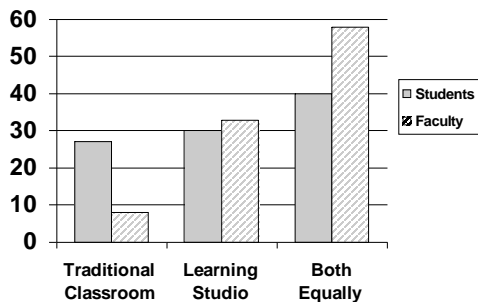


Figure 7

Figure 6

Environment that encourages self-direction

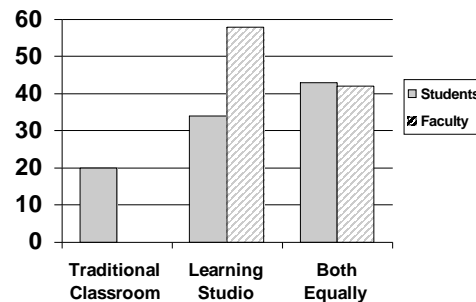
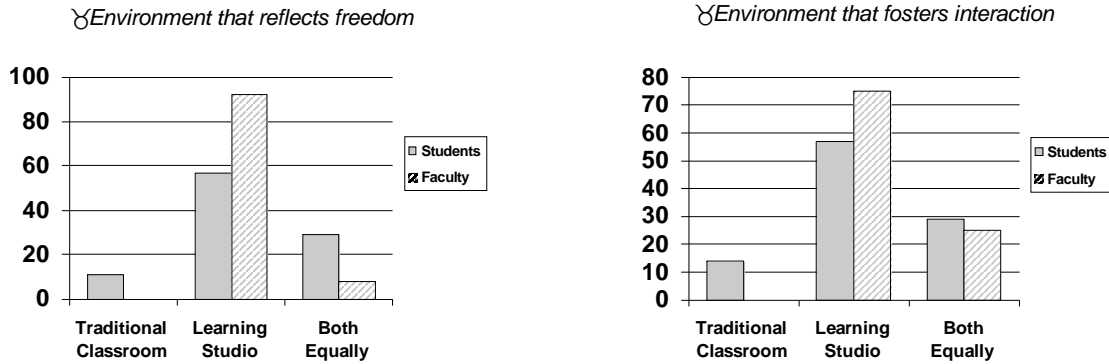


Figure 8



Qualitative

Overall both students and teachers reacted positively to the flexible environment, especially to the seating and the amount of desk space and white board space. However, some students found the furniture uncomfortable and were distracted by the noise from the other studio (separated only by a folding wall), even though a sound masker system had been installed with some positive results. Other concerns focused on the lack of a default arrangement creating a sense of disorganization and unpredictability for both teachers and students. Classes were not required to return the room to a predetermined arrangement, a practice which is standard for traditional classrooms. One teacher with a large class commented that testing was a problem in the learning studio because it is “almost impossible” to separate students.

Conclusions and Next Steps

These are, after all, *prototype* learning studios. Through my personal experience teaching in the learning studio and through an examination of the qualitative responses by students and teachers, it became increasingly clear to me that improvements in furniture, scheduling and teacher preparation will increase the effectiveness of this flexible learning space. Following are my reflections, observations, and recommendations.

Classroom design and furniture

Flexibility and mobility are only two considerations when selecting furniture. A third consideration is equally important: comfort. Taller students are unable to fit their legs comfortably under the tables because they hit their knees and shins on the table's crossbars and braces. Disparate responses to the chairs preclude making generalizations about them: some found them comfortable, others did not. However, it is difficult to maneuver around groups of seated students without tripping because the five legs of the chairs extend beyond the edge of the seats.

Before renovating the room into a learning studio, the classroom had seating for 32 students. The designers from Herman Miller Inc recommended that enrollment be limited to 25 after the renovation because moving furniture requires extra space. Currently there is seating in each room for 28, which is more than recommended, creating crowded conditions. The large telescoping white boards, although used by many of the classes, are bulky and take up a great deal of space as do the chairs because of their design. Therefore, reconfiguring the studio is problematic. Institutions considering renovating traditional classrooms into learning studios need to consider that maximum enrollment numbers will be decreased for those classes held in the studios.

Time considerations

Although the furniture in the learning studio moves easily and quickly, it still requires time to reconfigure space to meet teaching and learning needs. Three classes held in the learning studio were 50-minute classes—not long enough to manipulate the space. Classes held in the learning studio should be a minimum of 75 minutes.

Impact on teaching and learning

Although a flexible environment may not cause student engagement, it does support student engagement and an interactive teaching style. A teacher who uses active learning techniques in one class will use similar techniques in another regardless of the flexibility of the room and/or furniture. One teacher commented: “All of my classrooms allow me to reconfigure space. The Learning Studio furniture is, however, easier to move.” When I compared my two classes with other classes in the learning studio, I found statistically significant data relating to student engagement (Appendix). I have had extensive experience using active learning techniques such as seminars and collaborative and cooperative learning. Because I teach students in our teacher preparation program, I spend time exploring with my students their learning styles and multiple intelligences. I was prepared to manipulate the space, as were my students, and we did so eagerly.

It is important to note, however, that others teaching in the learning studio this semester did not choose to teach in that environment. They were in the studio simply because that class had been taught in that room the previous spring. These teachers were given no advance preparation or training for their experience in the learning studio except for the quick visit I made to each class the first day of the semester to explain the room’s concept and demonstrate how to move the furniture. Not all teachers are comfortable teaching in the learning studio; in fact, some prefer a traditional environment. For others, the learning studio is a perfect fit. However, I am reluctant to recommend guidelines for who should or should not have the opportunity to teach in this environment. In fact, being in a learning studio may encourage teachers to experiment with the flexible space as evidenced by the following comment from a teacher:

This is my first time in here [the learning studio], and as time went on I thought of ways I could have utilized the space better in previous lessons. It’s hard to break

patterns! But I would move around more in the future now that I've given it more thought.

Although the learning studio may not impact student engagement directly, it may increase teachers' use of active and collaborative learning activities which *will* increase student engagement.

Undoubtedly learning theory, pedagogy, and spaces are interdependent. The ideal scenario is that we, as educators, first understand how the brain learns, then carefully choose strategies that foster learning, and, finally, teach in a flexible environment that supports these strategies. However, I found little research on how to use flexible space to support active learning strategies or the effect of different arrangements on teaching and learning styles suggesting a need for more research in these areas.

Learning studios require a paradigm shift—for our students as well as for our teachers—and this will take time. In sum, it is evident from the data and from my experience that flexible space can assist but does not create “active, participatory, and experiential” learning. However, the learning studios can be a catalyst for change. We must invite teachers who use a variety of active learning strategies to teach in the learning studio and to share their experiences with other faculty. Teaching the same way in a flexible environment may not increase student engagement, but we may very well increase student engagement if a flexible environment encourages us to teach in different ways.

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APPENDIX

Interview Questions

1. Tell me about your experience in a Learning Studio and how you believe it affects your learning.

Follow-up:

How is this different from a traditional classroom?

2. Think about your preferred learning style: learning by hearing, learning by seeing, or learning by doing. In what ways did the Learning Studio allow you to learn in your preferred style?

3. How has taking a class in a Learning Studio affected your interaction with other students?

Follow-up:

In what ways do you interact differently with other students in the Learning Studio than you do in a traditional classroom?

4. How has being in a Learning Studio affected the way you approach course projects?

Follow-up:

How is this different from a traditional classroom?

5. Are there any other improvements related to the Learning Studio that you would like to share?

6. Is there anything you would change about the Learning Studio?

Significant Comparisons
All comparisons are significant at $\leq .05$

I. Results from Questionnaire A: Traditional Classrooms vs. Learning Studio

Group A = 3 classes held in **traditional classrooms** (same teachers as B) n=44
Group B = 3 classes held in **Learning Studio** (same teachers as A) n=40

Flexibility of Classroom

1. Question #40: How often have you...

Group A. Traditional Classrooms

	Average	Never=1	1-3 times =2	4-6 times =3	7-9 times =4	10 or more times=5
Moved things around to reconfigure this classroom to support the way you prefer to learn?	1.28	32 (73%)	10 (23%)			

Group B. Learning Studio

Moved things around to reconfigure this classroom to support the way you prefer to learn?	2.05	14 (35%)	15 (38%)	5 (13%)	2 (5%)	3 (8%)
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2. Question #55: What have you changed/moved around in this classroom to accommodate a learning activity?

Group A. Traditional Classrooms: 22 (50%) Did not move/change anything

Group B. Learning Studios 7 (18%) Did not move/change anything

II. Results from Learning Studio Classes (C) vs. Karen's Learning Studio Classes (D)

Group C = 6 classes held in Learning Studios (**not Karen's**) n=77
 Group D = 2 classes held in Learning Studios (**Karen's**) n=22

Flexibility of Classroom

3. Question #37: Please indicate the importance of the following statement:

Group C:

	Average	Not at all important=1	Somewhat Unimportant=2	Somewhat Important=3	Extremely Important=4
How important is the ability to reconfigure this classroom to support the way you prefer to learn?	2.66	9 (12%)	17 (22%)	38 (49%)	12 (16%)

Group D:

	Average	Not at all important=1	Somewhat Unimportant=2	Somewhat Important=3	Extremely Important=4
How important is the ability to reconfigure this classroom to support the way you prefer to learn?	3.23	1 (5%)	2 (9%)	10 (45%)	9 (41%)

4. Question #40: How often have you ...

Group C:

	Average	Never=1	1-3 times =2	4-6 times =3	7-9 times =4	10 or more times=5
Moved things around to reconfigure this classroom to meet the needs of a learning activity?	1.77	34 (44%)	31 (40%)	8 (10%)	4 (5%)	

Group D:

	Average	Never=1	1-3 times =2	4-6 times =3	7-9 times =4	10 or more times=5
Moved things around to reconfigure this classroom to meet the needs of a learning activity?	3.59	1 (5%)	5 (23%)	2 (9%)	8 (36%)	6 (27%)

5. Questions #43-45: What have you changed/moved around in this classroom to accommodate your learning style? (Only statistically significant responses are included.)

Group C:

- 35 (45%) Tables
- 2 (3%) Mobile Easels
- 4 (5%) Lighting

Group D:

- 18 (82%) Tables
- 6 (27%) Mobile Easels
- 5 (23%) Lighting

6. Questions #51-52: What have you changed/moved around in this classroom to accommodate a learning activity?

Group C:

- 4 (5%) Mobile Easels
- 5 (6%) Lighting
- 22 (29%) **Did not move/change anything**

Group D:

- 11 (50%) Mobile Easel
- 7 (32%) Lighting
- 1 (5%) **Did not move/change anything**

7. Question 73: What in this classroom has the most positive affect on your learning?

Group C:

- 8 (10%) Flexibility to reconfigure space

Group D:

- 9 (41%) Flexibility to reconfigure space

8. Questions #81: Please select the environment where you are most likely to ...

Group C:

	Average	Primarily in Traditional Classrooms	Primarily in Learning Studios	Both Environments Equally
Spend more time on task	1.84	15 (19%)	9 (12%)	35 (45%)

Group D:

	Average	Primarily in Traditional Classrooms	Primarily in Learning Studios	Both Environments Equally
Spend more time on task	2.50	2 (9%)	8 (36%)	13 (59%)

Course Feedback (Student Engagement)

9. Questions #118-119: During this current semester, to what extent did *this* course help you develop in the following areas?

Group C:

	Average	Never=1	Sometimes =2	Often=3	Very Often =4
Understanding your learning style	2.52	9 (12%)	24 (31%)	31 (40%)	11 (14%)
Supporting your learning style	2.56	9 (12%)	21 (27%)	30 (39%)	14 (18%)

Group D:

	Average	Never=1	Sometimes =2	Often=3	Very Often =4
Understanding your learning style	3.09	1 (5%)	2 (9%)	13 (59%)	6 (27%)
Supporting your learning style	3.05	1 (5%)	3 (14%)	12 (55%)	6 (27%)