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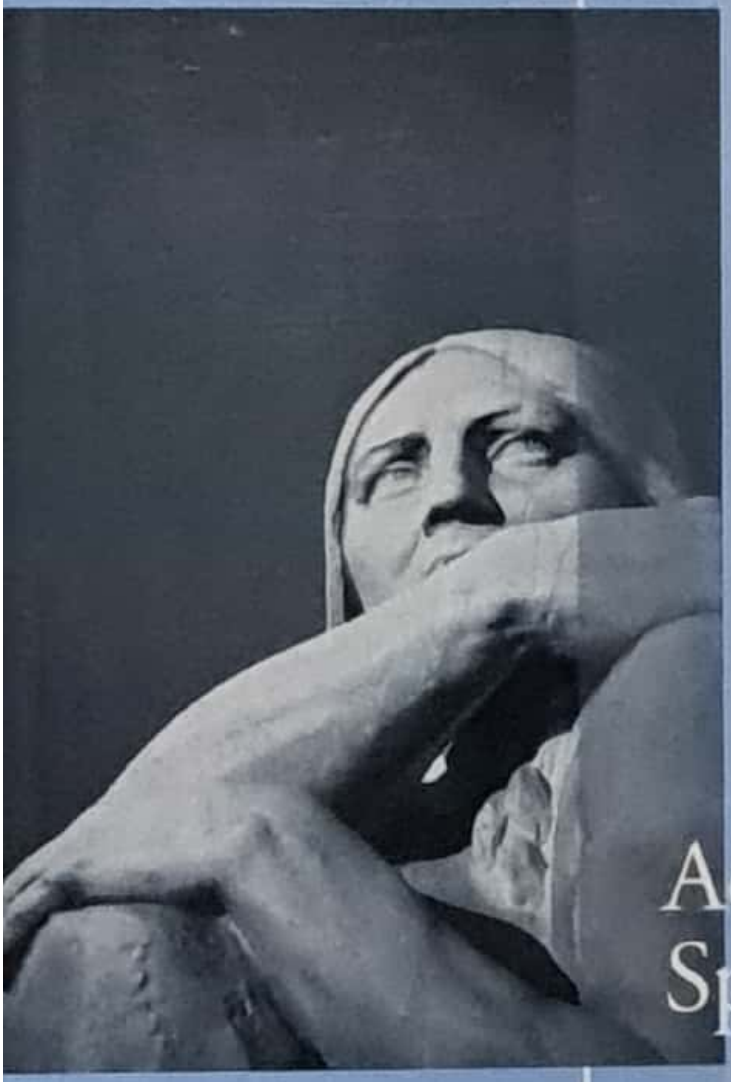

Active Learning Spaces

Paul Baepler
D. Christopher Brooks
J. D. Walker
Editors

Number 137 • Spring 2014

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Number 137 • Spring 2014
Jossey-Bass
San Francisco

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This chapter describes the results of an assessment project whose purpose was to improve the faculty-development program for instructors who teach in technology-infused TILE (Transform, Interact, Learn, Engage) classrooms at the University of Iowa. Qualitative research methods were critical for (1) learning about how students and instructors interacted in these new learning spaces and (2) improving faculty development to ensure that instructors could design and implement effective learning activities in the TILE environment.

Using Qualitative Research to Assess Teaching and Learning in Technology-Infused TILE Classrooms

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Introduction

The vision for TILE (Transform, Interact, Learn, Engage) classrooms originated in the spring of 2009, just months after a flood devastated the University of Iowa (UI) campus and in the midst of the Great Recession. Either of these challenging events might have pushed campus leaders to entrench and turn to well-known, risk-averse instructional delivery methods in traditional classrooms. Instead, a group of campus leaders used these two challenges to lead a change effort with the potential to improve student recruitment, increase student retention, bolster student success, use limited spaces more creatively, and build enthusiasm for new teaching models across campus.

This ambitious project, modeled after the SCALE-UP classrooms at North Carolina State University, leveraged federal stimulus funding and campus spaces that had been freed up by the closing of discipline-specific libraries. Leaders encouraged broad campus involvement to create interactive, high-tech classrooms and adopted the TILE acronym to highlight the principles of these rooms which were created to transform teaching and learning through increased student-faculty interaction and engagement. TILE classrooms are administered as a collaborative effort between

New Directions for Teaching and Learning, no. 137, Spring 2014 © 2014 Wiley Periodicals, Inc.
Published online in Wiley Online Library (wileyonlinelibrary.com) • DOI: 10.1002/tl.20082

Figure 2.1. Picture of 81-Seat TILE Classroom

Source: Photograph by Mike Jenn.

ITS-Instructional Services and the Center for Teaching, who develop training for faculty about how to facilitate active learning in classrooms that are designed to facilitate computer-supported, collaborative learning.

The TILE classrooms consist of round tables that seat nine students each, projectors and wall-mounted monitors that facilitate the sharing of information, and glass whiteboards for working out longer problems (see Figure 2.1 for an image of the 81-seat TILE classroom). Similar to the SCALE-UP classrooms, these learning environments are particularly suited to supporting certain learning strategies that involve collaboration and active engagement with content.

In this chapter, we report the findings from our qualitative research about teaching and learning in TILE classrooms that was conducted in the spring and fall semesters of 2011. Recognizing that prior research had demonstrated that learning environments like TILE classrooms were powerful instructional tools (for example, Beichner et al. 2007; Brooks 2011), we decided that qualitative research methods were best suited for our purpose of investigating in detail the processes of designing and implementing instruction in TILE classrooms. Marshall and Rossman (2010) point out that one of the characteristics of a qualitative study is that it focuses on the contexts of activity.

The main purpose of our research project was twofold. First, we wanted to learn about how and why instructors in TILE classrooms implemented

Table 2.1. Number of Procedures for Each Semester of Research Study

	Spring 2011	*Fall 2011*
Pre-semester interviews with instructors	6	7
Post-semester interviews with instructors	6	7
Student focus groups	7	6
Classroom observations	128	155

specific learning activities in the TILE classroom and how students perceived the usefulness of these activities. Second, we intended to synthesize our findings for our colleagues in ITS-Instructional Services to help them improve faculty development and the overall administration of TILE classrooms.

Research Methods

Our qualitative research methods enabled the researchers (Van Horne, Murniati, and Saichaie 2012) to collect rich descriptions of how instructors adapted their teaching strategies to fit the unique attributes of the TILE classrooms, how students participated in learning activities, and what students believed was beneficial about taking classes in TILE classrooms. We conducted semistructured interviews with each instructor at the beginning and end of the semester to learn about their attitudes toward teaching in a TILE classroom. We facilitated student focus groups to learn about what students believed was helpful and not as helpful about their activities in a TILE classroom. Lastly, we developed an observation protocol for documenting instructional activities. See Table 2.1 for a breakdown of the number of procedures carried out for each semester of the research study. (See the appendix of Van Horne, Murniati, and Saichaie [2012] for observation and interview protocols.)

For each case, the transcriptions, observations, and field notes were the basis of our preliminary coding across cases. From the interviews, focus groups, and class observations, we were able to extract emerging themes, such as reasons for using the TILE classrooms, the advantages of the room, technology-related problems, collaborative learning activities, and many other themes that pertain to teaching and learning in the TILE classrooms. The use of interviews, focus groups, and class observations has enabled us to answer our research questions from differing points of views; thus, we were able to maintain the trustworthiness of our study (Creswell 2003).

The Need for a Better Environment for Student-Centered Learning Activities

The TILE classrooms enabled instructors to use teaching methods that they believed could not be supported in regular "general assignment" (that is,

traditional) classrooms at the University of Iowa. In this section, we describe the experiences of two instructors, Professors Ackerman and Gallagher, who were part of a larger mixed-methods research study about the effectiveness of the TILE classrooms and the "fit" of learning activity and learning environment (see Van Horne, Murniati, and Saichaie 2012).

Both professors' teaching practices highlight some of the larger themes that emerged from our complete data sets: (1) instructors redesigned activities in collaborative learning environments by incorporating the learning tools and the technology in the TILE classrooms, (2) activities in the TILE classrooms work well when there is a mechanism to make sure that students prepared the materials prior to coming to class and stay on tasks during the class activities, and (3) students benefit greatly from the TILE environment when instructors give students more authority for sharing their work.

Professor Ackerman wanted to teach her undergraduate research methods course in a TILE classroom because when she had taught the course previously, the final grades had a bimodal distribution. She said in the first interview, "I wanted to try something new to see if I could get those kids who are not engaged in the course . . . to be a little more involved because it is a required course for them" (personal interview, February 22, 2011). She revamped the course so that the contents of her materials and the activities fit the design of the classroom. Professor Ackerman planned to supplement each lecture with collaborative activity so that students could apply what they had learned about the different research methods. For example, on one day early in the semester, Professor Ackerman facilitated an activity about the concepts of deduction and induction. The students used the laptops (working in small groups of three) to access web pages about Oscar nominations. Students analyzed the arguments in small groups, wrote up their results, and submitted them through the course management system. She then displayed the different answers on the screens and led a whole-group discussion in which most students participated. Professor Ackerman said that such activities appeared to motivate students who were reluctant to engage in the early part of the semester: "I just think it is about group interaction and giving kids something challenging and fun and kind of following up on it. And they bought into the system" (personal interview, May 23, 2011).

Professor Gallagher, who was teaching two courses in the TILE classroom during the semester she was in the study, decided to teach an undergraduate course about race in the TILE classroom because she had already planned a graduate course for the TILE classroom (personal interview, January 19, 2011). Originally, she had planned to teach just the graduate course in a TILE classroom because she wanted to "[get] the graduate students involved in active learning techniques, so that they could use them in their own classes." She emphasized that the TILE classroom would enable her to

"model" these teaching strategies for her students. But she also decided to teach an undergraduate class in a TILE classroom so that her students could engage in research activities that were not possible in a traditional classroom environment. In her first interview, she stated that she appreciated how easy it would be to move around the classroom and work one-to-one with students during discussion or group activities.

In addition, Professor Gallagher expected to be able to do various activities that she could not do in her previous courses. For example, she often had students examine Census data that were related to a specific theme, but this had been an out-of-class activity for students. Using a web-based program for data analysis, students collaborated in groups of three while they developed hypotheses and tested them. In her graduate course, students often engaged in class discussion about issues related to the design of instruction.

Our different qualitative research methods were useful in determining the value of the new design of instruction that Professor Gallagher employed in the TILE classroom. We observed a variety of ways that groups engaged in collaborative behavior. For example, in one class period, the students were analyzing Census data related to segregation in American cities. They used the wall-mounted monitors to display tables that included their analyses of the data. Using a cooperative learning strategy from the faculty-development program, the students worked in groups of three in which each person was a manager, a skeptic, or a recorder. (The manager helped keep the group on task; the skeptic questioned the group's findings and proposed alternative explanations; and the recorder kept notes about the activity.) In groups, the students practiced making hypotheses and discussing the results of their cross-tabulations. The professor and teaching assistant walked around the room, consulting with each group about certain results.

In Professor Ackerman's course, students worked actively together in groups at the round tables, though the wall-mounted monitors were not essential. In a typical class, the professor would lecture about a concept in the course, and students would then work together in groups on the laptop. They would download an assignment to work on together, use the laptop or whiteboard, and then upload their completed activity to the learning management system. Thus, the TILE classroom afforded the instructor a flexible learning environment to seamlessly move from a lecture to a student-centered activity in which students could take advantage of a variety of different tools.

Throughout the research project, the qualitative research methods were important for learning about how students interacted while using the group roles (recorder, manager, and skeptic). For example, we observed situations in which students were not engaged in these special group activities. In one observation, the student playing the role of the "recorder" was not engaged in the analysis of the data. Rather, this person functionally played the

exclusive role of a scribe. Professor Gallagher had decided to rotate regularly the assignment of group roles the next time she taught this course. We reported de-identified summaries of our observations to our colleagues so that they can refine the faculty-development program to enable instructors to use collaborative learning more effectively. The faculty-development team, in turn, began to emphasize the potential pitfalls of cooperative learning in the TILE classroom and used examples from the assessment to assist faculty members in attending to the composition of groups in collaborative learning activities. In addition, members of the assessment team gave presentations to faculty during training sessions to provide examples of effective collaborative learning strategies in TILE classrooms and how to plan for cases in which students are disengaged.

In their final interviews, both participants emphasized how teaching in the TILE learning environment had improved their instruction. Professor Gallagher said that the TILE environment had revolutionized her way of teaching her undergraduate course. With students doing the data analysis in class, she was able to provide feedback earlier, observe where students had difficulty with data analysis, and better prepare students for future assignments. In her final interview she said, "But because it was in the room, I could intervene and fix that as we were going along, and I didn't have to, you know, get a bunch of confused writing assignments" (personal interview, April 28, 2011). And Professor Ackerman indicated that students came to her office hours less that semester, which supported her own impression that the student-centered activities were better at helping students understand the concepts in research methods (personal interview, May 23, 2011). In addition, she reported that students who did not actively participate in the beginning of the course became more confident in contributing their ideas during group discussions and class discussions throughout the course. She noticed that improved student engagement was possibly due to the compulsory group work. She indicated that group work encouraged students to contribute more because every student realized he or she had a stake. Their voices were heard. They were not ignored. Students who did not attend in-class collaborative activities eventually realized that other group members suffered from their absence.

Faculty Development for TILE Instructors

Both of these faculty members had undergone training in the TILE Faculty Institute. This three-day, intensive workshop was modeled on a format developed by the Center for Teaching in 2005 and implemented seven times since. Faculty Institute participants learn specific pedagogical theories and strategies; they are then responsible for creating new courses that incorporate those pedagogies and teaching the courses at least three times during a three-year period. The Institute format has provided a springboard for the

rapid but thoughtful adoption of new pedagogies as well as the creation of a significant number of new high-impact practice courses at Iowa.

As the TILE project began, it became apparent that creative classroom design and sophisticated technology alone would not ensure the optimal learning experience for students. In fact, because students sit at round tables and the rooms lack a front focal point, the traditional lecture format can be counterproductive in these active learning spaces. To help faculty members maximize student learning, we decided to focus the Institute training on three pedagogical strategies: in-class, team-based learning; peer instruction; and inquiry-guided learning. Both of these participants emphasized that faculty development was essential to their success; Professor Ackerman said that the training was "essential" and would not recommend that anyone try teaching in a TILE classroom without that kind of support (personal interview, May 23, 2011).

The Challenges Instructors Face in TILE Classrooms

In addition to the successes of these instructors, our observations and interviews uncovered the difficulties that instructors faced in the TILE classrooms. For example, Professor Gallagher expressed that her new teaching strategies were much more time intensive. During one observation, the lead author observed the students working in groups to summarize different sections of a reading that was completed by the entire class. Although the students were engaged in the discussion of the themes of the reading, Professor Gallagher went around the room trying to remind students of the deadline. She remarked in the final interview that student-centered activities often took more time than she had allotted. In her final interview, she stated that she had "underestimated" the difficulty of the collaborative tasks (personal interview, April 28, 2011). Professor Ackerman's reflections on the collaborative tasks corroborated Professor Gallagher's statement. She indicated that in order to be actively engaged in collaborative tasks, students had to prepare the materials outside of class. Students who prepared in advance would come to class feeling more confident and would be able to contribute more significantly to the discussions.

We also learned about the teaching strategies that instructors did not think were a good fit for the TILE classroom. Professor Gallagher commented that the TILE classroom was not a good environment for a class discussion because people could not see each other. Based on the observations, this was more of an issue in the graduate course that was more centered on discussion than the undergraduate course. Professor Gallagher, indeed, decided that other graduate courses could be taught in a department seminar room because these students would not be engaging in collaborative problem solving.

Both professors emphasized that preparing a course for the TILE classroom is very time consuming. Professor Ackerman, though she had a

positive experience in the TILE classroom, said that she was not ready, at that time, to redesign another one of her courses so that it would be a good fit for the TILE classroom. Citing the fact that she worked at an "R1" institution, she indicated that she needed to devote more time to her scholarship. Thus, she planned to continue to teach her research methods course in a TILE classroom, but she said she would not be redesigning another course for some time (personal interview, May 23, 2011). Professor Gallagher also said it was a "time-consuming" activity to redesign a course to change the activities from lecture-based teaching strategies to those that involve more student construction of knowledge. She said, "I want them to [learn] about institutional racism without me just saying 'Here's what institutional racism looks like'" (personal interview, April 28, 2011). Although she wanted to continue to make her course more activity based, she stressed that she only had time to change a little at a time. Both instructors indicated that they would like to see more faculty members adopt the TILE classrooms, but also recognized that the time commitment would be an impediment.

Conclusion and Implications

The results of our research project indicate that qualitative research is a valuable tool for understanding how students and instructors participate in learning activities in the TILE classroom. For the instructors highlighted here, the TILE classrooms provided a classroom setting that enabled the facilitation of collaborative learning and the use of pedagogies that were not possible in traditional classroom environments. We developed detailed descriptions of effective instructional design, and this information has been useful in developing new training materials for faculty that are beginning to teach in TILE classrooms.

A broader lesson from the TILE experience at the University of Iowa concerns the importance of research-based faculty development in the use of such spaces. From an institutional perspective, we have learned that faculty development is essential to the success of TILE. Faculty who know how to use the technology and the features of the rooms, and to plan their courses accordingly, produce better student outcomes. Clearly, each instructor in this study gained experience in the use of active learning pedagogies and developed knowledge about what techniques are most effective. Qualitative research such as this is critical to bringing that information to a wider audience.

One implication of this research is that Instructional Services can help instructors to develop learning activities that are particularly suited to the kind of learning that professors want to happen in their TILE courses. Professors reported in our interviews that converting units from lecture-based activities to collaborative-learning activities is time consuming. Indeed, Professor Gallagher said that she only converted a portion of her class

to include activities that were appropriate for the TILE classroom. And yet, students were engaged and interested when they were participating in authentic activities—which suggests that the university should provide additional support for instructors who want to redesign their teaching to promote student engagement.

The TILE Initiative originated during a period when the University of Iowa could have turned away from creating dynamic learning environments and focused solely on creating more classrooms that are not as suited for technology-supported collaborative learning. We believe that the TILE Initiative will continue to grow and prosper in part because it was forged in a difficult time when it would have been easy to turn away from change. Now, academic units (such as the College of Pharmacy) across campus are embracing the TILE model and we are confident that these learning environments and the faculty-development program have become an essential element of the fabric of learning at the University of Iowa.

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This chapter describes the r[illegible] whose purpose was to improve the faculty-development program for instructors who teach in technology-infused TILE (T ransform, Interact, Learn, Engage) classrooms at the University of Iowa. Qualitative research methods were critical for (1) learning about how students and instructors interacted in these new learning spaces and (2) improving faculty development to ensure that instructors could design and implement effective learning activities in the TILE environment.

Using Qualitative Research to Assess Teaching and Learning in Technology-Infused TILE Classrooms

Sam Van Horne,Cecilia Titiek Murniati, Kem Saichaie, Maggie Jesse, Jean C. Florman, Beth F. Ingram

Introduction

The vision for TILE (Transform, Interact, Learn, Engage) classrooms originated in the spring of 2009, just months after a flood devastated the University of Iowa (UI) campus and in the midst of the Great Recession. Either of these challenging events might have pushed campus leaders to entrench and turn to well-known, risk-averse instructional delivery methods in traditional classrooms. Instead, a group of campus leaders used these two challenges to lead a change effort with the potential to improve student recruitment, increase student retention, bolster student success, use limited spaces more creatively, and build enthusiasm for new teaching models across campus.

This ambitious project, modeled after the SCALE-UP classrooms at North Carolina State University, leveraged federal stimulus funding and campus spaces that had been freed up by the closing of discipline-specific libraries. Leaders encouraged broad campus involvement to create interactive, high-tech classrooms and adopted the TILE acronym to highlight the principles of these rooms which were created to transform teaching and learning through increased student-faculty interaction and engagement. TILE classrooms are administered as a collaborative effort between

New Directions for Teaching and Learning, no. 137, Spring 2014 © 2014 Wiley Periodicals, Inc.
Published online in Wiley Online Library (wileyonlinelibrary.com) • DOI: 10.1002/tl.20082

Figure 2.1. Picture of 81-Seat TILE Classroom

Source: Photograph by Mike Jenn.

ITS-Instructional Services and the Center for Teaching, who develop training for faculty about how to facilitate active learning in classrooms that are designed to facilitate computer-supported, collaborative learning.

The TILE classrooms consist of round tables that seat nine students each, projectors and wall-mounted monitors that facilitate the sharing of information, and glass whiteboards for working out longer problems (see Figure 2.1 for an image of the 81-seat TILE classroom). Similar to the SCALE-UP classrooms, these learning environments are particularly suited to supporting certain learning strategies that involve collaboration and active engagement with content.

In this chapter, we report the findings from our qualitative research about teaching and learning in TILE classrooms that was conducted in the spring and fall semesters of 2011. Recognizing that prior research had demonstrated that learning environments like TILE classrooms were powerful instructional tools (for example, Beichner et al. 2007; Brooks 2011), we decided that qualitative research methods were best suited for our purpose of investigating in detail the processes of designing and implementing instruction in TILE classrooms. Marshall and Rossman (2010) point out that one of the characteristics ofa qualitative study is that it focuses on the contexts of activity.

The main purpose of our research project was twofold. First, we wanted to learn about how and why instructors in TILE classrooms implemented

Table 2.1. Number of Procedures for Each Semester of Research Study

	Spring 2011	*Fall 2011*
Pre-semester interviews with instructors	6	7
Post-semester interviews with instructors	6	7
Student focus groups	7	6
Classroom observations	128	155

specific learning activities in the TILE classroom and how students perceived the usefulness of these activities. Second, we intended to synthesize our findings for our colleagues in ITS-Instructional Services to help them improve faculty development and the overall administration of TILE classrooms.

Research Methods

Our qualitative research methods enabled the researchers (Van Horne, Murniati, and Saichaie 2012) to collect rich descriptions of how instructors adapted their teaching strategies to fit the unique attributes of the TILE classrooms, how students participated in learning activities, and what students believed was beneficial about taking classes in TILE classrooms. We conducted semistructured interviews with each instructor at the beginning and end of the semester to learn about their attitudes toward teaching in a TILE classroom. We facilitated student focus groups to learn about what students believed was helpful and not as helpful about their activities in a TILE classroom. Lastly, we developed an observation protocol for documenting instructional activities. See Table 2.1 for a breakdown of the number of procedures carried out for each semester of the research study. (See the appendix of Van Horne, Murniati, and Saichaie [2012] for observation and interview protocols.)

For each case, the transcriptions, observations, and field notes were the basis of our preliminary coding across cases. From the interviews, focus groups, and class observations, we were able to extract emerging themes, such as reasons for using the TILE classrooms, the advantages of the room, technology-related problems, collaborative learning activities, and many other themes that pertain to teaching and learning in the TILE classrooms. The use of interviews, focus groups, and class observations has enabled us to answer our research questions from differing points of views; thus, we were able to maintain the trustworthiness of our study (Creswell 2003).

The Need for a Better Environment for Student-Centered Learning Activities

The TILE classrooms enabled instructors to use teaching methods that they believed could not be supported in regular "general assignment" (that is,

traditional) classrooms at the University of Iowa. In this section, we describe the experiences of two instructors, Professors Ackerman and Gallagher, who were part of a larger mixed-methods research study about the effectiveness of the TILE classrooms and the "fit" of learning activity and learning environment (see Van Horne, Murniati, and Saichaie 2012).

Both professors' teaching practices highlight some of the larger themes that emerged from our complete data sets: (1) instructors redesigned activities in collaborative learning environments by incorporating the learning tools and the technology in the TILE classrooms, (2) activities in the TILE classrooms work well when there is a mechanism to make sure that students prepared the materials prior to coming to class and stay on tasks during the class activities, and (3) students benefit greatly from the TILE environment when instructors give students more authority for sharing their work.

Professor Ackerman wanted to teach her undergraduate research methods course in a TILE classroom because when she had taught the course previously, the final grades had a bimodal distribution. She said in the first interview, "I wanted to try something new to see if I could get those kids who are not engaged in the course . . . to be a little more involved because it is a required course for them" (personal interview, February 22, 2011). She revamped the course so that the contents of her materials and the activities fit the design of the classroom. Professor Ackerman planned to supplement each lecture with collaborative activity so that students could apply what they had learned about the different research methods. For example, on one day early in the semester, Professor Ackerman facilitated an activity about the concepts of deduction and induction. The students used the laptops (working in small groups of three) to access web pages about Oscar nominations. Students analyzed the arguments in small groups, wrote up their results, and submitted them through the course management system. She then displayed the different answers on the screens and led a whole-group discussion in which most students participated. Professor Ackerman said that such activities appeared to motivate students who were reluctant to engage in the early part of the semester: "I just think it is about group interaction and giving kids something challenging and fun and kind of following up on it. And they bought into the system" (personal interview, May 23, 2011).

Professor Gallagher, who was teaching two courses in the TILE classroom during the semester she was in the study, decided to teach an undergraduate course about race in the TILE classroom because she had already planned a graduate course for the TILE classroom (personal interview, January 19, 2011). Originally, she had planned to teach just the graduate course in a TILE classroom because she wanted to "[get] the graduate students involved in active learning techniques, so that they could use them in their own classes." She emphasized that the TILE classroom would enable her to

"model" these teaching strategies for her students. But she also decided to teach an undergraduate class in a TILE classroom so that her students could engage in research activities that were not possible in a traditional classroom environment. In her first interview, she stated that she appreciated how easy it would be to move around the classroom and work one-to-one with students during discussion or group activities.

In addition, Professor Gallagher expected to be able to do various activities that she could not do in her previous courses. For example, she often had students examine Census data that were related to a specific theme, but this had been an out-of-class activity for students. Using a web-based program for data analysis, students collaborated in groups of three while they developed hypotheses and tested them. In her graduate course, students often engaged in class discussion about issues related to the design of instruction.

Our different qualitative research methods were useful in determining the value of the new design of instruction that Professor Gallagher employed in the TILE classroom. We observed a variety of ways that groups engaged in collaborative behavior. For example, in one class period, the students were analyzing Census data related to segregation in American cities. They used the wall-mounted monitors to display tables that included their analyses of the data. Using a cooperative learning strategy from the faculty-development program, the students worked in groups of three in which each person was a manager, a skeptic, or a recorder. (The manager helped keep the group on task; the skeptic questioned the group's findings and proposed alternative explanations; and the recorder kept notes about the activity.) In groups, the students practiced making hypotheses and discussing the results of their cross-tabulations. The professor and teaching assistant walked around the room, consulting with each group about certain results.

In Professor Ackerman's course, students worked actively together in groups at the round tables, though the wall-mounted monitors were not essential. In a typical class, the professor would lecture about a concept in the course, and students would then work together in groups on the laptop. They would download an assignment to work on together, use the laptop or whiteboard, and then upload their completed activity to the learning management system. Thus, the TILE classroom afforded the instructor a flexible learning environment to seamlessly move from a lecture to a student-centered activity in which students could take advantage of a variety of different tools.

Throughout the research project, the qualitative research methods were important for learning about how students interacted while using the group roles (recorder, manager, and skeptic). For example, we observed situations in which students were not engaged in these special group activities. In one observation, the student playing the role of the "recorder" was not engaged in the analysis of the data. Rather, this person functionally played the

exclusive role of a scribe. Professor Gallagher had decided to rotate regularly the assignment of group roles the next time she taught this course. We reported de-identified summaries of our observations to our colleagues so that they can refine the faculty-development program to enable instructors to use collaborative learning more effectively. The faculty-development team, in turn, began to emphasize the potential pitfalls of cooperative learning in the TILE classroom and used examples from the assessment to assist faculty members in attending to the composition of groups in collaborative learning activities. In addition, members of the assessment team gave presentations to faculty during training sessions to provide examples of effective collaborative learning strategies in TILE classrooms and how to plan for cases in which students are disengaged.

In their final interviews, both participants emphasized how teaching in the TILE learning environment had improved their instruction. Professor Gallagher said that the TILE environment had revolutionized her way of teaching her undergraduate course. With students doing the data analysis in class, she was able to provide feedback earlier, observe where students had difficulty with data analysis, and better prepare students for future assignments. In her final interview she said, "But because it was in the room, I could intervene and fix that as we were going along, and I didn't have to, you know, get a bunch of confused writing assignments" (personal interview, April 28, 2011). And Professor Ackerman indicated that students came to her office hours less that semester, which supported her own impression that the student-centered activities were better at helping students understand the concepts in research methods (personal interview, May 23, 2011). In addition, she reported that students who did not actively participate in the beginning of the course became more confident in contributing their ideas during group discussions and class discussions throughout the course. She noticed that improved student engagement was possibly due to the compulsory group work. She indicated that group work encouraged students to contribute more because every student realized he or she had a stake. Their voices were heard. They were not ignored. Students who did not attend in-class collaborative activities eventually realized that other group members suffered from their absence.

Faculty Development for TILE Instructors

Both of these faculty members had undergone training in the TILE Faculty Institute. This three-day, intensive workshop was modeled on a format developed by the Center for Teaching in 2005 and implemented seven times since. Faculty Institute participants learn specific pedagogical theories and strategies; they are then responsible for creating new courses that incorporate those pedagogies and teaching the courses at least three times during a three-year period. The Institute format has provided a springboard for the

rapid but thoughtful adoption of new pedagogies as well as the creation of a significant number of new high-impact practice courses at Iowa.

As the TILE project began, it became apparent that creative classroom design and sophisticated technology alone would not ensure the optimal learning experience for students. In fact, because students sit at round tables and the rooms lack a front focal point, the traditional lecture format can be counterproductive in these active learning spaces. To help faculty members maximize student learning, we decided to focus the Institute training on three pedagogical strategies: in-class, team-based learning; peer instruction; and inquiry-guided learning. Both of these participants emphasized that faculty development was essential to their success; Professor Ackerman said that the training was "essential" and would not recommend that anyone try teaching in a TILE classroom without that kind of support (personal interview, May 23, 2011).

The Challenges Instructors Face in TILE Classrooms

In addition to the successes of these instructors, our observations and interviews uncovered the difficulties that instructors faced in the TILE classrooms. For example, Professor Gallagher expressed that her new teaching strategies were much more time intensive. During one observation, the lead author observed the students working in groups to summarize different sections of a reading that was completed by the entire class. Although the students were engaged in the discussion of the themes of the reading, Professor Gallagher went around the room trying to remind students of the deadline. She remarked in the final interview that student-centered activities often took more time than she had allotted. In her final interview, she stated that she had "underestimated" the difficulty of the collaborative tasks (personal interview, April 28, 2011). Professor Ackerman's reflections on the collaborative tasks corroborated Professor Gallagher's statement. She indicated that in order to be actively engaged in collaborative tasks, students had to prepare the materials outside of class. Students who prepared in advance would come to class feeling more confident and would be able to contribute more significantly to the discussions.

We also learned about the teaching strategies that instructors did not think were a good fit for the TILE classroom. Professor Gallagher commented that the TILE classroom was not a good environment for a class discussion because people could not see each other. Based on the observations, this was more of an issue in the graduate course that was more centered on discussion than the undergraduate course. Professor Gallagher, indeed, decided that other graduate courses could be taught in a department seminar room because these students would not be engaging in collaborative problem solving.

Both professors emphasized that preparing a course for the TILE classroom is very time consuming. Professor Ackerman, though she had a

positive experience in the TILE classroom, said that she was not ready, at that time, to redesign another one of her courses so that it would be a good fit forthe TILE classroom. Citing the fact that she worked at an "R1" institution, she indicated that she needed to devote more time to her scholarship. Thus, she planned to continue to teach her research methods course in a TILE classroom, but she said she would not be redesigning another course for some time (personal interview, May 23, 2011). Professor Gallagher also said it was a "time-consuming" activity to redesign a course to change the activities from lecture-based teaching strategies to those that involve more student construction of knowledge. She said, "I want them to [learn] about institutional racism without me just saying 'Here's what institutional racism looks like'" (personal interview, April 28, 2011). Although she wanted to continue to make her course more activity based, she stressed that she only had time to change a little at a time. Both instructors indicated that they would like to see more faculty members adopt the TILE classrooms, but also recognized that the time commitment would be an impediment.

Conclusion and Implications

The results of our research project indicate that qualitative research is a valuable tool for understanding how students and instructors participate in learning activities in the TILE classroom. For the instructors highlighted here, the TILE classrooms provided a classroom setting that enabled the facilitation of collaborative learning and the use of pedagogies that were not possible in traditional classroom environments. We developed detailed descriptions of effective instructional design, and this information has been useful in developing new training materials for faculty that are beginning to teach in TILE classrooms.

A broader lesson from the TILE experience at the University of Iowa concerns the importance of research-based faculty development in the use of such spaces. From an institutional perspective, we have learned that faculty development is essential to the success of TILE. Faculty who know how to use the technology and the features of the rooms, and to plan their courses accordingly, produce better student outcomes. Clearly, each instructor in this study gained experience in the use of active learning pedagogies and developed knowledge about what techniques are most effective. Qualitative research such as this is critical to bringing that information to a wider audience.

One implication of this research is that Instructional Services can help instructors to develop learning activities that are particularly suited to the kind of learning that professors want to happen in their TILE courses. Professors reported in our interviews that converting units from lecture-based activities to collaborative-learning activities is time consuming. Indeed, Professor Gallagher said that she only converted a portion of her class

to include activities that were appropriate for the TILE classroom. And yet, students were engaged and interested when they were participating in authentic activities—which suggests that the university should provide additional support for instructors who want to redesign their teaching to promote student engagement.

The TILE Initiative originated during a period when the University of Iowa could have turned away from creating dynamic learning environments and focused solely on creating more classrooms that are not as suited for technology-supported collaborative learning. We believe that the TILE Initiative will continue to grow and prosper in part because it was forged in a difficult time when it would have been easy to turn away from change. Now, academic units (such as the College of Pharmacy) across campus are embracing the TILE model and we are confident that these learning environments and the faculty-development program have become an essential element of the fabric of learning at the University of Iowa.

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