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This chapter introduces a University of Iowa effort to enhance and support active learning pedagogies in technology-enhanced (TILE) classrooms and three elements that proved essential to the campus-wide adoption of those pedagogies. It then describes the impact of those professional development efforts on the curricula and cultures of three departments in the College of Liberal Arts & Sciences.

TILE at Iowa: Adoption and Adaptation

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Introduction

Thoughtful, effective teaching strategies are centrally important to the transformation of undergraduate student learning. While undergraduate student learning can occur in many settings and with the help of various facilitators, the heart of a university is the student/faculty¹ relationship and the educational experience that occurs within a course. Faculty members who effectively incorporate active learning pedagogies into their courses fundamentally change the classroom dynamic from one where the instructor is the deliverer of knowledge and the student is the passive recipient, to one where the instructor is a facilitator and guide for the students' active engagement with course content. Active learning pedagogies such as service learning and inquiry-guided learning (IGL) contextualize learning in authentic problems,² encourage collaborative effort and peer instruction, and challenge students to be more responsible for their own learning (Kuh 2008).

This chapter will describe the professional development provided to faculty members involved in an institutional project to encourage the implementation of active learning pedagogy as well as how that pedagogical shift created culture change within and even between several departments at the University of Iowa. Three elements stand out as essential to the broad success of the transformational changes brought about by TILE (Transform, Interact, Learn, Engage) at Iowa: leadership, communication, and collaboration.

Laying the Groundwork

In the 2009 spring semester, campus leaders at the University of Iowa began to envision an institution-wide project to develop technology-enhanced

classrooms. Modeled on the SCALE-UP prototype designed at North Carolina State University (Beichner 2008, 2013), Iowa's TILE classrooms were designed to encourage active, engaged learning. Each TILE classroom provides round, nine-person tables, three laptop computers per table (to encourage members of each three-person team to work collaboratively), an LCD screen for each table, wall-to-wall glass boards, and a "control station" that is centrally situated among the student tables.

The Office of the Provost created a Learning Spaces Executive Team (LSEC)³ to generate space design ideas, free up funding, and manage access to the TILE classrooms. After considerable discussion, the team also recognized the critical importance of pedagogical training for faculty members who would be developing the new TILE courses and teaching them in the new TILE rooms. Thus, from the relatively early stages of the project, effective implementation of active learning pedagogies was considered vitally important to successful student learning in the TILE classrooms.

Staff members in the Center for Teaching (CfT) and Information Technology Services-Instructional Services (ITS-IS) began to design a systematic approach to faculty professional development that focused on pedagogies best suited for the TILE classrooms: inquiry-guided learning (Lee 2004), peer instruction (Mazur 1997), and in-class, team-based learning (Smith, Johnson, and Johnson 1991). SCALE-UP and similar models on other campuses offered clues about successful teaching strategies in physics and other STEM disciplines; we were convinced that the three pedagogical approaches in TILE classrooms would apply as well to the social sciences and humanities courses.

To broaden interest, we set the stage to interest faculty members in the TILE pedagogies and the new room designs. The Center for Teaching offered workshops on various aspects of student-centered teaching.⁴ The Center and ITS-IS hosted two open conversations on TILE that brought together more than 100 faculty members from across collegiate boundaries to discuss the project, its implications for faculty teaching roles, and its potential impact on student learning. During one of these conversations, we "beamed in Bob"—a videoconference with SCALE-UP developer and Professor of Physics at North Carolina State University, Robert Beichner. As a professional peer and an active learning practitioner, Beichner was particularly adept at leveraging scholarly evidence and personal experience in response to faculty questions.

During two later events, we simulated the TILE experience for faculty members who gamely worked through simple inquiry-guided, team-based exercises related to the social sciences and humanities. They then graciously provided feedback about their experience as "students" as well as what kinds of professional support they would need to design and teach new TILE courses.⁵

Based on these experiences, we developed a three-day institute, which provided faculty participants an opportunity to immerse themselves in the

principles and practice of the specific “TILE pedagogies,” the time and resources to enhance their professional development, and a chance to forge new bonds with colleagues across disciplines and colleges.

The Institutes were copresented by visiting experts and CfT and ITS-IS staff. Bob Beichner led the first Institute (May 2010). The second and third Institutes (May 2011 and October 2012) were led by Jon Gaffney, who at the time was a physics postdoctoral researcher at the University of Kentucky. The fourth Institute was conducted solely by CfT and ITS-IS staff. Because a substantial number of faculty participants were in the social sciences and humanities, presenters provided non-STEM examples and exercises that especially resonated with those faculty members. And all but the first institute included two demonstrations by faculty members—one in STEM and the other in the social sciences or the humanities—who had already taught in the TILE classrooms.

The Institutes provided the theoretical grounding of inquiry-guided, team-based learning and a summary of the development of SCALE-UP at North Carolina State University. Using short lectures, video clips, and active learning strategies, we explored the nature of good teamwork and how to form, sustain, and assess effective teams; the power of learning as inquiry, the importance of creating strong learning objectives, and strategies for creating academically challenging questions that engage students in authentic learning; and the logistics of the classroom, including how to seamlessly incorporate technology (including whiteboards and clickers) and how to disengage from the control center and engage with the entire class.

Following the Institutes, faculty participants⁶ were expected to incorporate the pedagogy and teach a new course three times during the next three years. During the course design phase, the TILE faculty fellows worked one-on-one with CfT staff and graduate students in ITS-IS. Faculty members also informally sought out their TILE colleagues with questions and offers to sit in on classes.

The four Institutes launched sixty faculty members into the world of TILE. Nevertheless, it became clear that faculty enthusiasm and scarce staff resources made problematic the likelihood of continuing multi-day Institutes. A new plan was developed to provide intensive, multi-hour training followed by periodic, topic-specific workshops. Since May 2012, the foundational sessions—TILE Essentials—have included the primary topics of the longer Institutes, albeit in a compressed format. “Essentials” are offered three times a year and fulfill the requirement that a faculty member must be “TILE-enabled” prior to scheduling a course in a TILE room.

TILE Accelerators are periodic, one-hour sessions that focus on specific areas of applied TILE practice, including enhanced technology training, learning assessment, and course transformation. Similar to the post-Institute period, instructors who participate in Accelerators can consult one-on-one with ITS-IS or CfT staff.

The new training format continues to draw interested faculty members. Nevertheless, central administration and collegiate leadership, open and frequent communication, and the best-laid professional development plans did not alone ensure a faculty welcome to teaching transformation. Collaboration with department chairs proved to be the critical fourth piece of the puzzle that ensured the broad adoption of these active learning pedagogies, acceptance of the redesigned, tech-infused classrooms, and creative adaptation of the TILE model.

Departmental Buy-In

From the earliest planning phases, we were convinced that Departmental Executive Officers (DEOs, or “chairs”) would be invaluable contributors to the overall success of the TILE project. Staff members from the C&T and ITS-IS visited department chairs from six departments that teach a large number of undergraduate students. We discussed the benefits of student-centered, IGL teaching and outlined the project objectives and timetable, and we emphasized the importance of faculty pedagogical development and support and answered questions about how converting traditional classrooms to TILE classrooms would affect each department.

Department leaders appreciated being consulted and agreed to spread the word to other DEOs, a number of whom encouraged their own faculty to become involved in the TILE institutes. DEOs in Physics, Geoscience, Spanish and Portuguese, Biology, and Urban and Regional Planning participated in the three-day TILE institutes or the shorter TILE Essentials. While several of them actually incorporated the TILE pedagogies in their own courses, others participated in the training largely to learn about the approach and the technology, better understand how students would be learning in TILE courses, and consider how this provost- and college-sponsored project might play out in their departments.

DEOs proved crucial to the success of TILE in another respect. As sometimes happens when a new teaching idea is presented, some people on campus worried that departments would discourage new, untenured faculty from “taking the risk” to invest time in learning the “new” pedagogy and create courses that often require considerable prep time when compared to traditional lecture courses. To our delight, however, a number of DEOs and senior faculty encouraged their younger colleagues to participate in the TILE Institutes and create new TILE courses. One DEO expressed the rationale for this support thus: Why should a new faculty member get into the habit of teaching stand-and-deliver lectures and then have to relearn a more engaging, student-centered approach five years later once they have tenure?

In at least one case, a new assistant professor in biology was—in his words—“actually told to teach the TILE way” in his very first course

at Iowa.⁷ In addition, the biology DEO⁸ provided crucial support by connecting new faculty members with experienced mentors and sending them to external faculty development opportunities, such as the Howard Hughes Medical Institutes hosted by the University of Wisconsin-Madison.⁹

The narrative of TILE in the Department of Physics and Astronomy likewise involved a supportive DEO who joined two physics faculty members in one of the three-day TILE Institutes.¹⁰ The faculty members then collaborated to create and teach a TILE version of the lab sections for the introductory astronomy large-lecture courses. After they assessed the course as taught in the TILE classroom and decided that a slightly different classroom design would better suit the team-based, inquiry-guided approach for one of their lab courses, their DEO provided funding to purchase crescent-shaped tables for another classroom.¹¹

Perhaps the most surprising case of a department embracing TILE occurred in the Department of Spanish and Portuguese. The narrative of TILE in Spanish and Portuguese was remarkable for several reasons: The pedagogy gained a foothold even before the first TILE Institute; it was rapidly adopted by a significant number of faculty members; and it was one of the first humanities departments at Iowa that became “TILE-enabled.”

The DEO of Spanish and Portuguese¹² was an enthusiastic “fan,” transforming the first of four courses even before the inaugural TILE Institute, and then continuing to advocate for the TILE pedagogies on campus and at conferences. Like early adopters in biology and physics, he welcomed UI colleagues to sit in on his classes, and although the courses were taught in Spanish, visitors nevertheless learned by watching him finesse the teaching technologies and roam the TILE classroom guiding student teams and challenging them to think more deeply about the course content. He notes that the TILE approach was “a pretty easy sell” in his department, whose faculty members were already attuned to new pedagogies and technologies for teaching foreign language, literature, and culture. Nevertheless, he helped ease faculty members’ worry about risk by exercising the power of the purse with travel funds and research support to reward faculty members who took the initiative to engage with TILE.

Spanish and Portuguese was also distinguished by the fact that its successor DEO¹³ also participated in one of the three-day TILE Institutes and proved to be a strong advocate of the pedagogy within her department and across campus. Thus, faculty members in the department—including early-career faculty—have benefited from the assurance that their efforts would be recognized and supported from one administration to the next—continuity that is essential when trying to encourage faculty members to take on a new teaching challenge. During the last three years across the dual tenures of these DEOs, eleven faculty members in Spanish and Portuguese have participated in the TILE pedagogical training, created new courses based on TILE principles and practices, and presented about their TILE experiences on campus and at national conferences.

Shifting Perspectives and Remaining Questions

A growing cadre of UI faculty members seeks pedagogical training and access to TILE rooms, and a number of them are now applying active learning TILE pedagogies in non-TILE rooms. More than a dozen TILE faculty fellows have volunteered to mentor their peers and demonstrated TILE exercises (“modules”) at conferences and for local high school teachers, UI faculty members, deans, the UI Provost and President, members of the Iowa Board of Regents, and the Governor of Iowa.

Of course, not all faculty members choose this way to teach and the lecture approach also has benefits, including the ability to more efficiently reach large numbers of students and transfer more content knowledge. In addition, students often prefer modes of learning where they are not required to actively engage with their instructors or each other. To at least partially address potential student resistance (or at least bafflement) about TILE, Iowa faculty members have found it important to talk to students at the outset of the course about why they are meeting in such an “odd” room, what will be expected of them, and how it will enhance their ability to learn and practice the higher-order critical thinking skills they will be expected to implement throughout their lives. Thus, these courses begin by talking about learning and student responsibility—a thread that recurs as the courses unfold.

Not infrequently, Iowa faculty members and administrators discuss issues about the tipping point beyond which students might experience too many TILE courses, particularly if they are majors in a department that has a rich array of TILE courses. There is no doubt that inquiry-guided and team-based courses demand more of students—a willingness to accept and grapple with more uncertainty, to interact with other students and instructors, and often to invest more out-of-class time learning foundational knowledge. As the impact of TILE courses on departmental curricula begins to be felt at Iowa, continued conversation—and even scholarly examination—will begin to provide thoughtful, evidence-based ideas about curriculum design and development.

As faculty members continue to develop and apply TILE pedagogies at the University of Iowa, professional development for teaching assistants becomes increasingly important. Teaching the technology is relatively simple—the “switching station” is a touch screen that requires about fifteen minutes to divine. Understanding the philosophy and practice of inquiry-guided learning, peer instruction, and team-based learning, however, can mean a profound shift in attitudes about learning objectives, assessment, classroom management, and the very meaning of learning in higher education. In many courses, teaching assistants (TAs) are on the frontlines of interaction with students, and helping TAs understand the philosophy and purposes of active learning TILE courses will encourage their buy-in. When a disconnect occurs between the style of learning

in a faculty-led TILE class and the style of interaction between TAs and students, undergraduates become confused about what is expected of them and how they are supposed to learn.

Training TAs in TILE pedagogies demands the investment of considerable resources, so several departments have developed creative ways to achieve their goals for TA development. A physics faculty member actively involves teaching assistants in the course design process so they learn how to create effective inquiry-guided, team-based, in-class exercises.

Two biology faculty members designed TILE exercises for TAs who teach the dry lab for “Foundations of Biology.” The inquiry-guided learning, team-based dry lab exercises are fundamentally different from the “recipe” approach of the traditional lab experience. The faculty members meet weekly with the TAs to present the week’s TILE exercises and how those should be implemented. Although time-intensive for the faculty members, this approach has been very successful and this model is now being considered by other departments.

In the future, the CfT and ITS-IS will develop a systematic training program for graduate students interested in the TILE approach. Additional discipline-specific application of these pedagogies could be provided by senior TAs in each department who have completed such training and taught in TILE classrooms. Departments also could offer one-semester graduate courses in TILE pedagogy as it relates to their own disciplinary needs.

As the University of Iowa and other campuses continue to implement the SCALE-UP model and make it their own, institutional and department leadership, broad and frequent communication, and boundary-breaking collaboration in the design and teaching of inquiry-guided, team-based courses will be essential in transforming student learning for a new century. Through the TILE Project, the words “transform, interact, learn, and engage” will continue to apply to faculty members as well as students.

Notes

1. For purposes of this chapter, “faculty” will refer to any instructor, whether tenured, tenure-track, adjunct, or instructional staff member.
2. Authentic learning “focuses on real-world, complex problems and their solutions...” (Lombardi 2007, 2).
3. The current team includes the Associate Provost for Undergraduate Education, CIO, Associate Dean of the College of Liberal Arts & Sciences, Director of the Center for Teaching, Senior Director of Information Technology Services-Instructional Services, Associate Director for Space Planning and Utilizations, Dean of Students, Associate Registrar, and Manager, Instructional Services.
4. Presenters have included: University of Minnesota (UMN) Center for Teaching and Learning Director David Langley (inquiry-guided learning), UMN Professor of Biology and Dean of the College of Biological Sciences Robyn Wright (the SCALE-UP model at Minnesota), Chancellor’s Professor of Higher Education Emeritus at Indiana University Bloomington and NSSE founder George Kuh (high-impact practice), Vanderbilt Center for Teaching Director Derek Bruff (student response systems), Harvard’s Balkanski Professor of Physics Eric Mazur (peer instruction, Big Data, and active learning), and UI Associate Professor of Chemistry Renee Cole (inquiry-guided learning and POGIL).

5. We specifically designed exercises not related to STEM disciplines since we wanted to broaden the impact beyond the sciences and math.

6. Because of their high visibility and institutional impact, the Institutes drew both faculty members who had previously worked with the CFT and IS as well as those who had not. Of the 112 faculty members who have participated in TILE professional development by spring 2013, 43 had previously been involved in more than one CFT-sponsored professional development event or at least one full-day teaching workshop, and 20 of those individuals had already participated in one or more multi-day faculty development Institute conducted in the years before the TILE project.

7. Assistant Professor of Biology Andrew Forbes.

8. DEO and Professor of Biology Bernd Fritsch.

9. Following the redesign of the “Understanding Evolution” course as an inquiry-guided, team-based course, enrollment has increased each year, from 27 to 48 to 62 students, a phenomenon that also occurred in other biology courses taught with TILE pedagogies, including “Fundamental Genetics.”

10. DEO and Professor of Physics Mary Hall Reno, Professor of Physics Robert Mutel, and Associate Professor of Physics Cornelia Lang.

11. The success of the astronomy lab project spurred one of the faculty members—Lang—to pursue another teaching challenge and develop a two-semester TILE course that she sometimes facetiously describes as “tracing the origins of everything” from the Big Bang through the “primordial soup” and the evolution of living organisms, ending with the rise of early hominids. This “Big Idea” inquiry-guided course will be collaboratively developed and taught by TILE-trained faculty members (and one DEO) in five departments: Physics and Astronomy, Chemistry, Biology, Geoscience, and Anthropology. The shared perspective of teaching inquiry-guided, team-based courses in TILE classrooms has enabled the seven faculty members to effectively collaborate to create and teach this rich and multifaceted course. Lang’s creative efforts to apply and enhance inquiry-guided, team-based learning were recognized by a Provost’s Office Student Success Grant and the President and Provost Award for Teaching Excellence.

12. DEO and Professor of Spanish and Portuguese Tom Lewis.

13. Professor of Spanish and Portuguese Mercedes Nino-Murcia.

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