

With a Little Help From Your Students: A New Model for Faculty Development and Online Course Design

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Institutions of higher education are faced with the challenge of developing faculty who are ready, willing, and able to teach online. Standard approaches towards faculty development often miss the dynamic and complex relationship between content, pedagogy, and technology. Our approach has faculty members and graduate students participate in a unique seminar where they work collaboratively to design online courses. We describe our “learning by design” approach and present evidence of how this approach respects the realities and complexities of teaching online. We use evidence from multiple sources (interviews, surveys, observations, and artifacts developed) to develop a model of online teaching that posits successful courses require the careful integration of three components that coconstrain each other: *content*, *pedagogy*, and *technology*.

The late Douglas Adams (1997), author of *The Hitchhiker’s Guide to the Galaxy*, uncovered an important principle relevant to educational technology—The Someone Else’s Problem (SEP) field. The SEP is a fictional technology that can make something “virtually invisible” because we think it is *somebody else’s problem*. It is not that the object in question really vanishes. It does not. It may in fact even catch you by surprise out of the corner of your eye. The idea of the SEP is that once we consider something as being outside of the arena of our concerns, that something, for all practical

purposes, ceases to exist. The SEP may be a fictional construct, but something similar happens sometimes when educators meet technology. Consider for instance the following quote taken from a faculty member:

I don't know a lot about the technical stuff of the computer. I don't feel like I want to know that, or need to know that....I don't need to know how to compress stuff and, you know, other people can do that. That's not what I wanna do. I don't know how the telephone works either. Nor do I care (Dr. Shaker, interview, May 2, 2001).²

We do not offer this quote as a way of criticizing any faculty member, but to point to a perceived separation between pedagogy and technology. Similar to Snow's (1959) idea of two cultures, teachers and techies live in different worlds, ignoring each other's existence as much as possible.

Because technology is increasingly becoming an important part of higher education such a stance is increasingly untenable. However, integrating technology into existing pedagogical practices is not a trivial issue. Moreover, it is difficult to determine the kinds of changes such integration will lead to. There are two extreme views about this. Those who believe in technological determinism see technology as the possible emancipator of education. They argue that technology will fundamentally change existing practices. In contrast, the social determinists, see technology as having little impact on education systems and practices, arguing that technology (as with other innovations in the past) will get co-opted into existing educational practices leading to little or no change.

If there is anything common to both camps, it is a strong sense of determinism—driven by imperatives of technology in one case and societal and institutional inertia in the other. However, one needs to be skeptical about drawing any deterministic conclusions on the effects of technology. We argue, as have others, that simple deterministic discourses miss the point. Technology and pedagogy exist in a dialogic relationship with each other, embedded in a complex web of relationships and feedback mechanisms (Bruce, 1997; Koehler, Mishra, Hershey, & Peruski, 2002; Mishra, Koehler, Hershey, & Peruski, 2001, 2002; Zhao & Cziko, 2001; Mishra & Koehler, 2003). Cause-effect mechanisms are difficult to trace because they are multi-threaded and complexly interwoven. In contrast to deterministic positions (of either flavor) is the “transactional stance” (Bruce, 1997). According to this stance, predictions about technology are made only after studying both individual and social patterns of interactions with technology. Studying engagement of people with real tasks, in real-life situations is crucial to understanding the future relationship between technology and pedagogy.

Sadly, even scholars who support more complex perspectives on integrating technology and education find it difficult to offer concrete models or frameworks to guide educators. In this article we offer a model of how technology, pedagogy, and content are related to each other. We constructed this model based on data collected through a unique semester-long “learning by design” graduate seminar in which faculty and students worked together to develop online courses. The model seeks to develop a more comprehensive and encompassing perspective on technology integration in particular in the design of online courses.

The structure of the article is as follows. We present the context for developing online courses at our university. We then look at prior models of faculty development and technology integration. We propose an alternative, design-based approach and present our experiences and lessons learned from one iteration of this model. From this experience we develop a transactional and dynamic model for developing online courses that may inform future attempts to integrate technology and culture.

Online Learning: The Push to Integrate

Institutions of higher education are faced with the challenge of developing faculty who are ready, willing, and able to teach in the online world. Our institution, Michigan State University, is no different in this regard. In the fall of 2001, the College of Education at Michigan State University began offering a Master’s degree program available entirely online. We have been struck by how challenging the issues are for developing faculty to teach online, so that the educational experience is of high quality for both the faculty and the students. Furthermore, universities making large-scale financial commitments want to get more than just a few qualified online instructors. Their goal is to find ways in which the knowledge, skills, and expertise diffuses throughout the institution. The constraints and challenges are many and real.

- Faculty members, who are accustomed to only thinking about teaching and courses in a more traditional face-to-face classroom, are often reluctant to tackle the job of teaching in a technological medium. Many faculty do not find value in learning the details of technology, believing that it only takes time (a limited resource) away from thinking about pedagogy and the other responsibilities they have, and that they may care more about.

- Faculty members are often not well versed in technology. Additionally, many have learned successfully to be students and instructors without the use of technology, and therefore often question its relevance.
- Faculty members often have extremely busy schedules and thus have limited time to devote to learning new technologies. Preparing to teach a new course (or an online version of a current course) requires extensive investments of time, something most faculty find burdensome (Harris & DiPaolo, 1999; Loeding & Winn, 1999).
- Institutions often lack opinion leaders who have taught online and who can act as role models for less experienced faculty. Current diffusion theories emphasize how important opinion leaders are for acceptance within the larger social system (Rogers, 1995). Thus institutions must also find ways to support and develop opinion leaders before convincing some less interested faculty members to take the plunge.
- Faculty members often have preconceived notions and attitudes about technologies. Furthermore, research has shown these attitudinal beliefs are far more important than structural and technical obstacles in influencing the use of technology in higher education (Clark 1993; Dillon & Walsh, 1992). However, changing attitudes is a difficult and time-consuming task. Many institutions may not have the time or resources to devote to this undertaking.

Traditional Approaches: Overly Simple Approaches to Complex Problems

A range of techniques have been developed and implemented by institutions of higher education to address these problems. Too often these approaches have been simplistic, ignoring the complexities inherent in technology based pedagogy of specific content areas. Before discussing our approach, we point out the inadequacies of more traditional approaches to faculty development.

Workshops and tutorials. It may seem like commonsense to simply identify the skills that faculty need to teach online, develop a workshop to impart these skills to the faculty, and devise ways to make faculty attend these workshops. However, traditional workshop and seminar approaches (voluntary or mandated) are ill-suited to develop deep understanding of the relationships between the technology and pedagogy that come together in effective practice. These courses treat technology as being separate from pedagogy and assume that once an instructor learns a particular piece of technology

they will effortlessly figure out ways of using it in their teaching. This approach is misguided and shortsighted because it treats technology and pedagogy as if they existed in separate conceptual worlds with little, if any, interaction with each other. More importantly, it gives short thrift to the actual content to be taught assuming that the content is irrelevant to the course design³.

Technical support group. Another standard approach to offering faculty members technical support advocates the creation of a group of technical experts who are always available to assist faculty in times of need. There are some advantages in this model, specifically, the separation of roles depending on expertise. However, there are some problems with this approach as well.

To make these issues more concrete we offer an example from our University. MSU has developed a special unit called the Virtual University (VU) for supporting faculty members to teach online. According to this approach, faculty members are responsible for developing the content of the course while the VU staff, consisting of designers and programmers, develop technology (Figure 1). For instance, at MSU, the VU staff has developed a series of software modules (called “widgets”) that can be integrated into different courses. These widgets include a discussion board, chat rooms, file uploading facilities, and so forth. Interaction between the faculty members and the designers and programmers is through the “Producer,” also an employee of VU. The producer is the key person in this equation who takes the ideas developed by the faculty member and instantiates them using the tools made available by the technical staff. However, the producers rarely, if ever, have backgrounds in education or instructional design. Yet, they are charged with helping faculty to reconfigure their ideas to match the tools available.

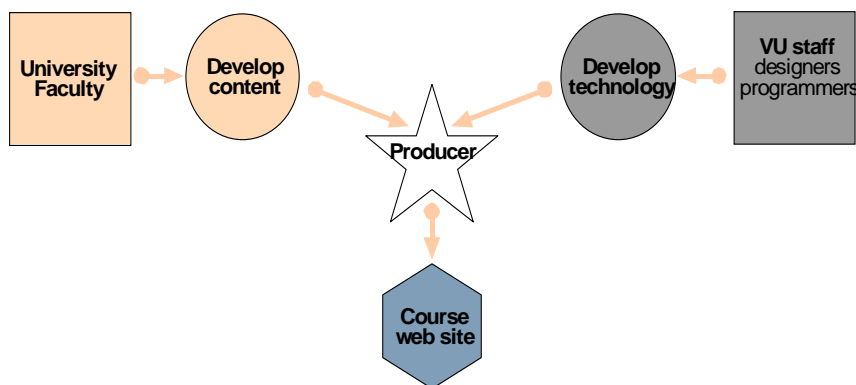


Figure 1. Virtual University approach for supporting faculty in developing online courses

We believe that there is an inappropriate division of labor in this approach. The faculty develops the course content, while the technology programmers design widgets. These widgets are content neutral but, in some sense, constrain the kinds of representations possible. For example, the VU producer is put in a difficult spot when asked to figure out how to merge the technology with the course and pedagogical beliefs provided by the faculty members, even though the pieces of the course were designed without any knowledge of the other piece. The faculty members often lack sufficient knowledge of the technology and its possibilities. Thus, faculty are constrained by what is offered to them by the producer. As a consequence, overall course quality is likely to suffer.

We believe that leaving these design decisions to the producers and other technical experts negatively impacts pedagogy. Form and function are intimately related and we believe that faculty members need to be the ones making these decisions. Unfortunately, in the VU approach, the producers may end up making decisions that have unintended pedagogical consequences.

Faculty members also get short-changed, they never get to experience the interaction of the technology with content, pedagogy, and representation. Thus, they do not gain a knowledge about what goes on inside that black box, nor do they have opportunities to learn how course content and pedagogical representations co-constrain technology and vice versa. In this approach, the technology is often taken out of the faculty members' hands, particularly if they are not intrinsically interested in learning about it. Ironically, this lack of a need to learn about the technology is often touted as being the main value of having the producer.

Another drawback of the VU approach is that it leads to uniformity and the one-size-fits-all approach towards course development. Most VU courses look like clones of each other. Institutional practices get stabilized as producers present incoming faculty members with existing online course designs and since the faculty do not know better, they continue to replicate what has "worked before." We believe that different course content should lead to different representations and technologies. It is our experience that courses taught face-to-face often differ drastically from each other when taught by different faculty members and even when taught by the same faculty member at different times. Faculty members bring their personality, their individuality to the course, its presentation and its execution. However, in most online courses, the individual faculty member is often missing from the presentation of the course, or at best relegated to a corner of the web site (the corner that contains the mandatory instructor's picture and bio). Lost in the process are the variety, richness and individuality that faculty members

bring to their teaching. That is, the VU approach somehow loses track of how course content, the faculty member, and pedagogy all affect the overall design⁴.

Finally, the VU approach leaves faculty professional development to the last stage of the process—the actual teaching of the course. The faculty gets limited opportunities to play with the technology and the online course options before they get to teach it. For the faculty, the first time is real-time, throwing them into the teaching of the online course without offering them a chance to reflect on the process prior to teaching it.

To the Rescue: The Design Team Approach

The aforementioned criticisms plague many other approaches to faculty development and technology integration. At the heart of the problem is the view that content, pedagogy, and technology are independent of each other. Such a modular approach that values division of labor for different aspects of teaching does not lead to quality education. Instead, we suggest that *there is no single technological solution that applies for every teacher, every course, or every view of teaching*. Quality teaching requires developing a nuanced understanding of the complex relationships between technology, content, and pedagogy and using this understanding to develop appropriate, context specific strategies and representations. Productive faculty development needs to consider all three issues not in isolation but rather taken together⁵.

Menges (1994) listed the different standard approaches that have been found to be successful for faculty development. These are (a) workshops and seminars; (b) individual consultation; (c) grants for instructional improvements; (c) resource materials, such as books and newsletters; and (d) colleagues helping colleagues. We see each of them as being valuable in different ways. Our “learning by design” approach can, at one level, be seen as being a combination of all of the suggested strategies. Instead of handing the web-programmers a set of materials that worked in the face-to-face classroom, the “learning by design” approach advocates that expert teachers take a hand in the design of the technology to support their pedagogical purposes. This approach relies on the process of design to develop the necessary skills and relationships for understanding the nuances of integrating technology and pedagogy. That is, the design approach attempts to make faculty members fluent in negotiating the interactions between pedagogy, content, and technology by developing their competencies with technology, and by giving them experiences with the interactions of the three components (technology, pedagogy, content).

Advantages of design. Design is often misconstrued as being embodied in the final product, merely cosmetic changes to an artifact that has been engineered, or as the mere application of scientific problem-solving (what Schon called the myth of technical rationality) to a problem (Schon, 1983). In contrast to this we offer design as being a process that is spontaneous, unpredictable, messy, creative, and hard to define. It is a dialogue between constraints and tradeoffs. It is a process that does not offer easy solutions. The best one can hope for is, in Simon's (1968) wonderful phrase, "satisficing." Design (like teaching) is as much an art as it is a science (Dewey, 1920).

This emphasis on design has been informed by long-standing research on the use of design for learning complex and interrelated ideas (Blumenfeld et. al., 1991; Brown, 1992; Harel & Papert; 1990; Kafai, 1996; Perkins, 1986). Design-based activities not only provide a rich context for learning, they also lend themselves to sustained inquiry and revision that will help designers come away with the deep understanding needed to apply knowledge in the complex domains of real world practice (Mishra & Koehler, 2003 Vyas & Mishra, 2002).

Instantiating learning by design. At Michigan State University, the design approach is represented in an educational technology Master's level course. Master's students enroll to learn how to design technology to help solve a problem of educational practice. During the Spring 2001 offering of the course, six tenured faculty members were also enrolled as "students" in the design course. Teams consisting of one faculty member and three or four Master's students worked on designing an online course that would be taught by the faculty member in the following year. The major activities of the course consisted of readings, explorations with technology, prototyping of the online course, online and inclass discussions, and peer review and feedback. A typical class period consisted of a whole group component (to discuss readings and issues that applied to all groups), and a small group component for the design teams to work on their projects.

A range of incentives was offered to the various groups in the class. The six faculty participants received a laptop computer and \$1000 for developing the course. The faculty however did not receive any course buyout or overload pay for this work. Of course, the opportunity of working with other faculty members and graduate students was also an incentive. For the students it was an opportunity to work with faculty members on an authentic project, to learn about educational technology and online teaching and learning, and to earn three more credits towards their final degree. The incentive for two of the four authors, the instructors of the course, was an opportunity

to build on our research agenda on learning through design. It allowed us to take our ideas about methods for developing technological proficiency in educators (Mishra & Koehler, 2003; Mishra, Zhao, & Tan, 1999), and test them within the realm of developing online courses.

Studying learning by design. The purpose was to study the outcomes from students' and faculty's participation in the course. Of particular interest was developing a better understanding of the factors that constrain and support the development of genuine technology integration.

Throughout the semester there was a range of data collected from the normal day to day functioning of the class, including postings made to the discussion groups, e-mails, artifacts created by the groups (such as web pages or *PowerPoint* presentations), observations by the instructors, and a final reflection paper from the students. Specifically, their paper needed to address: their thoughts on learning in design teams; what they learned about technology, pedagogy, design, and other issues related to online learning; and their recommendations for future instantiations of the course.

At the end of the semester, after grades had been assigned, students participating in the seminar completed a short e-mail survey. This survey focused on questions about how roles in their groups were established, how decisions were made, what was learned while developing an online course, and the technologies involved in online course development. In addition, the participating faculty members were interviewed by the fourth author (a graduate student not involved in the design or teaching of the seminar). The hour-long semi-structured interview probed faculty members about their changes in their perceptions of online course development, pedagogical beliefs, and group work.

Sources of data (progress reports, group postings, e-mail interviews with the students, in-depth interviews with the faculty members, the students' reflection papers, and chronological screen-shots of the development of the course website) were used to develop case studies of the design groups. Initially, all of the data were reviewed to identify emerging themes that were discussed among all of the members of the research group. The data were reviewed again to create a chronological narrative of the development of the course. Simultaneously, the focus was on how the important themes developed, came to the forefront and receded into the background. The process of analyzing the development of the course was iterative—the data and instantiations of the analysis were continually revisited based on feedback from other members in the group.

Analysis revealed that the scenarios enacted by each design group have common elements that play out in unique ways depending upon the course,

the faculty member, and the students in the team. Common to each group were various episodes of grappling with issues surrounding the content, issues of pedagogy, and technology. There were three stages that characterized the progress of the design teams. In the first stage, the emphasis was on determining proper goals and roles for the participants as well as constructing the first draft of the course web site. The second stage was characterized by role consolidation and a broader, group-wide, concern with issues of representation of course content, and pedagogical strategies possible in this new technological medium—the World Wide Web (WWW or Web). In the final stage, towards the end of the semester, groups tended to focus on integrating different parts of their course to fit together smoothly, or work on a problem of particular interest to the group. Although each group spent a differing amount of time in each stage they all progressed through each stage during the course.

A PORTRAIT OF THE DESIGN APPROACH

The following sections present a picture of the design approach at several levels of analysis: (a) from the standpoint of the student, (b) the standpoint of the faculty participants, and (c) from the viewpoint offered at the group level.

The Graduate Student Experience

Although the emphasis of this article is on faculty development and technology integration there was also significant value realized by the regular student participants in the course. These findings are reported briefly here and have been reported more extensively elsewhere (Koehler, et. al, 2002; Mishra, et. al, 2001, 2002).

In many ways, this design course was a typical graduate class experience for the students—they read articles, discussed ideas, and were responsible for meeting course deadlines. However, there were some important differences. These students learned a lot about technology—they were exposed to several technologies, they assessed their usefulness, and used some of them in the design of the online class. In more traditional technology courses, students explicitly learn target technologies as part of the course (e.g., web design, digital video, etc). In contrast, the design approach made learning about technology implicit—students learned about technologies as they needed to in order to fulfill some desired feature of the course they were designing.

However despite this “implicit approach” students were exposed to a range of different technologies and managed to focus their attention on particular technologies that were most appropriate for the task at hand. For instance, one student wrote, “This course was a wonderful experience for me, and I gained a lot of new knowledge and information that I found very useful...The best thing that I learned from this course was about FTP and digitizing videos, which was something new” (Grace, e-mail survey, May 20, 2001).

The course also presented students with opportunities they would otherwise not have. For example, most graduate students have never designed a course before (online or otherwise), or even had the chance to consider their role as future teachers. Also, the chance to work with tenured faculty provided novel experiences for most of the students. Too often, graduate students’ experiences with their professors seem opaque—they only get to see final products of their thought processes (e.g., research papers, courses they take, etc.). By working with expert educators, they interacted with ideas in ways that they are seldom allowed—they worked over a whole semester with these ideas, got to influence the experts’ ideas, and apply them to a real problem.

Most students reported this course as being one of the best courses they had had in their graduate program. Working on an authentic design problem, within a group led by a faculty member made the experience a unique one.

The Faculty Experience

Each of the six faculty-led design teams successfully designed part or all of a course. Of those six, five have been further refined through the VU process and were taught in subsequent semesters⁶.

Designing courses for a face-to-face environment was something that all faculty members had a lot of experience with. However, like most experts, firmly established work activities were characterized by automatic routines and tacit knowledge and practices. However, introducing a new context (the Web), where the rules of face-to-face teaching do not necessarily apply, challenged faculty to establish new ways of thinking about course design. It required the development of new procedures, tools, and artifacts to represent and teach their content on the Web. Hence faculty participants had to seek new forms of support and collaboration to develop solutions to these new problems. For example, a major concern of all faculty members was how to engage online students with course readings. Faculty used their student group members to test out their ideas and make revisions as needed. One faculty member noted,

I was shocked because I had...given everybody a sample chapter....I boxed it, bolded it, the things that I wanted to be salient. They still didn't see it. So that told me it was only when we sat face to face and I said okay, here is a little pretest I'm thinking about, answer that one question and they couldn't. And they didn't even know they'd read it and they didn't even know where it was....That was a very poignant test for me, it said...we have to think much more carefully about how we're going to signal the students relative to what is really salient here. (Dr. Patten, interview, May 1, 2001)

However, the struggle was not without merit, one may argue that it was essential. The faculty participants were able, through their experiences in the design class, to successfully reconcile differences between their past teaching experiences and the challenges posed by the new online environments. That is, they developed a more sensitive understanding of the transactional relationship between content, pedagogy and technology.

Faculty also developed a deeper understanding of technology. Teaching online courses requires a level of familiarity and comfort with technology that many faculty members lacked. Although faculty members were the "content experts," they typically were not the technology experts. Consequently, developing an online course required collaboration with individuals who are experts in technology (the course instructors and knowledgeable graduate students). Accordingly they not only became more knowledgeable about various technologies, their understanding of technology became realistic, and was more likely to inform the relationship between technical decisions and the impact on pedagogy. For example, one faculty member mentioned how the class discussions increased her knowledge of what is possible with technology,

I think there were applications I hadn't seen before. I'd seen streaming video but I'd never seen how it could be linked...used in a course so I kinda thought about them concretely for the first time. We spent some time almost every week talking about something technical and those were very interesting to me. What's a server?...What's HTML?...So all that stuff I learned....That was a nice byproduct of getting to think about teaching. (Dr. Shaker, interview, May 2, 2001)

Finally, the faculty members benefited from their interaction with the graduate students. The graduate students proved to be a valuable source of ideas. As one faculty member said:

One of the most challenging and confrontive (sic) groups I ever worked with and that's been very healthy and refreshing. I've confronted them about the way I want to do things and they've confronted me like "you can't do it that way," or "it doesn't make sense to do it that way," so that's been very refreshing. It hasn't been personal at all,...not challenging in a negative way but it's been stimulating the group process. (Dr. Kusik, interview, May 1, 2001)

Furthermore, by bringing to bear their own experiences as students, and by imagining themselves in the online class they were developing, the graduate students were able to give faculty members feedback about the likely effect the design would have on prospective students. As one faculty member said:

Talking through with my team and actually developing those discussions I think it's...going to be simpler and clearer (for students) than I thought at the beginning and one thing that a couple people (in my group) recommended to me is for those discussions, don't leave them open ended. Connect them to a text chapter and have some very focused items or, or questions or focus points for each web talk conversation....In person in the past I would have tended to be more loose and students kind of pick up indirectly and maybe that's been one of the things that hasn't worked real well for me so that's an example of being very explicit in terms of today, based on this content, we're having this discussion. ...that's one of the examples, I think, that'll help. (Dr. Kusik, interview, May 1, 2001)

All of the faculty members commented on the value of the collaborative process of course design with students. One noted, somewhat modestly, "I think that was one of the most interesting things is that what was actually produced was largely their (students) work. I mean, they, they actually did the design, the graphics and all that stuff was all their work" (Dr. Derex interview, May 7, 2001).

Another faculty member talked about how diverse her group members were in terms of their skills and how each member uniquely contributed to her course. The group members' roles fell out over time and each member became a specialist in various areas. For example, one student was the technology expert. "(He) was instrumental in making the site happen and building the site...technical development...and the look" (Dr. Shaker, interview, May 2, 2001). Another student was a student affairs expert. He helped Dr. Shaker to expand upon the class-wide discussions they had had on creating a community of learners in an online class—something that she wanted but was uncertain how to implement online. Because of his existing interest in

the topic, the student did extra reading/research into that area and came up with some exercises and activities that Dr. Shaker could incorporate into her online course. Subsequently, they worked together with the group's technology expert to integrate the community building activities with the content and the technology to create a "whole" that met Dr. Shaker's pedagogical goals.

I have a wonderful very diverse group including a guy who is a god at this (technology) and has been very instrumental in making the site happen and building the site. We had (another) person, his area is leadership, students services...and he's very interested in communities and how you build communities and he's been doing a lot of reading about development of community so he had a lot of really good ideas about activities you could do to do that—structures you could put in place to do that so he was instrumental in kind of pushing that aspect of the course. (Dr. Shaker, interview, May 2, 2001)

Dr. Shaker's comments are representative of all faculty members' comments about the fruitfulness of distribution of responsibilities in their groups. Although this was a feature that was criticized earlier in the article, there is a larger issue here. It is not expected or desirable for faculty members to become expert graphic designers, or web designers. That would be unrealistic as well as a waste of time and it would defeat the whole value of specialization. Faculty members are specialists in content and pedagogy, and that is their greatest strength. However, learning by design allows them to be involved in each aspect of online course design and thus become better and more sensitive users of technology. Essentially it opens up the black box of design, so that faculty come to understand what is possible with technology and how it can be effectively integrated with their content and facilitate their pedagogical goals.

UNDERSTANDING THE DESIGN GROUPS: A CASE STUDY OF DR. SHAKER'S GROUP

The summary description of faculty members' experiences presents only broad themes covered by most of the groups, but does not offer a detailed account of the actual experience of any one faculty member as they contended with issues of online course development. Understanding of the process of technology integration requires indepth study of educators' engagement with authentic tasks in real life situations. Thus a detailed case study of one of the design groups from the "learning technology through design" seminar

is presented next. A case study of any of the groups would tell a similar story, however, we present only one representative case, that of Dr. Shaker. This group was chosen for pragmatic reasons—Dr. Shaker’s group generated the most detailed record of their activity during the course. Accordingly, this group regularly archived intermediate versions of their website, and kept copies of their e-mail exchanges.

Dr. Shaker, a tenured faculty member in the School Psychology program, led the group. She took the class, “to really give myself, force myself the luxury of thinking critically about teaching in this format and in any other format. That was really a luxury of the course and that’s what I wanted” (Dr. Shaker, interview, May 2, 2001).

Dr. Shaker was designing a course on classroom discipline. It was an intensive, six-week summer course that was a compilation of courses she had previously taught. The course was intended to provide school psychologists with a ramp up to what classrooms are really like and how they should function optimally. They would solve typical classroom management problems and learn how to handle difficult situations and challenging kids. The students would comprise both her usual school psychology students as well as practicing teachers, a group she had not taught in the past.

At the beginning of the “learning technology through design” seminar, Dr. Shaker held what are believed to be fairly common views about technology—that the details are unimportant for teachers. (See quote at the beginning of the article.) In the group with Dr. Shaker were three graduate students, Clark, Pat, and Xi. These students had very different backgrounds, interests, and technical knowledge. Clark was a student in the Master’s program in Educational Technology and this was his last course for the program. He had been looking for a cumulating project, in his final paper he wrote “...my focus for this project was to consolidate all of the ideas into one place and create a reference site that would be helpful to others, and to myself, to go back to after the course was done and have some legacy of the process during the Instructional Design program.”

Pat was a graduate student in Student Affairs Administration and was looking for a project that was related to his area of study. As he wrote,

initially I was somewhat disappointed with the material that I would be developing. I have no real interest in secondary education discipline theories. It did not take me to long to realize that the content of the course was not the important part of the group process. Finding a way to translate [Dr. Shaker’s] pedagogical style to the Web was.

The last student member in Dr. Shaker’s group, Xi, was a doctoral student in Educational Psychology and saw this course as being a “fun and new experience.”

As was typical in all of the groups, the design of Dr. Shaker's course developed over several iterations. Early in the design process the content of the course shifted, in part, in response to her concerns about her audience. "I laid it all out and then realized I don't like that so I'm reworking it a little bit now. (It) was way too conceptual. So I'm having to kind of rethink application and integration" (Dr. Shaker, interview, May 2, 2001). Eventually her group settled on a structure for the course that would include three units (or days) per week for six weeks. The first day would be content/information based with reading assignments from both paper-bound texts and from web sites. Day two would be a small group format where they would analyze cases of problem students, develop a group product, and post results to the site for everyone to review. On day three, the whole class would look within and between group products and do more reflection and analysis.

The course content/design also shifted in response to other concerns that came out during class-wide (and out of class) discussions. In addition, the college informed Dr. Shaker that most of the students in the Online Master's program were practicing teachers. This was a change from her previous experience with teaching students in the school psychology program. In response to this Dr. Shaker decided to use less theory and focus more on case work. As she said:

So that's what I'm struggling with now is really how to make it a little bit more pragmatic because the teachers don't want to do concepts you know just show me something that I can use in my classroom tomorrow. So I'm a little concerned about the dual audience and trying to think about how do I really frame this so that I can provide enough conceptual background so the stuff we're doing makes sense, but not overwhelm these teachers with theoretical stuff that they don't want to get involved in. (Dr. Shaker, interview, May 2, 2001)

Stage 1: Getting started

In the first stage of development, all of the groups wrestled with how to get started. Direct observation revealed that this initial struggle had two components: getting started as a design team (defining roles, learning to work together, etc.), and deciding what an online class should be.

Thrown together for the first time, the groups had to face the struggle of finding a model for them to work together. The faculty was unclear as to how much direction they were supposed to provide. They were often unsure of their knowledge of the technology and what they could expect from the students in their groups. As Dr. Shaker said:

These guys know so much about how to do stuff that they were kind of waiting for me to give them direction and this is where I said I tried very hard not to control the group because I didn't feel like I could provide direction early on in the course. I was clueless. And so they were really instrumental in going, well, let's try this. Let's play with this idea and see how it works. (Dr. Shaker, interview, May 2, 2001)

The other struggle was how to start developing an online course—the majority of faculty had never taught online before, and most of the students had not taken an online course before. Dr. Shaker did not really know what was likely to appear.

Even though I'd kicked these ideas around with my husband, I never really thought seriously about how would I teach online. This was my first opportunity to really do that. And I didn't have a clue, not a clue of what was possible. And so I felt like I lost about 5 weeks at the beginning of the semester because I was clueless (Dr. Shaker, interview, May 2, 2001).

This impasse was finally broken about five weeks into the class following a series of group brainstorming sessions for the overall format of the course. Dr. Shaker described the course as she had taught it in face-to-face situations. However, there was no clear idea as to how this course (that had worked successfully in the past) would work in the online arena. It was difficult for the group to even begin representing ideas and concepts in this new environment. It was at this time that Clark stepped in and created the first mockup site. As Dr. Shaker describes it,

We sat down and I did some storyboarding one day in class and we sat down and we kind of brainstormed some ideas about what it might look like and I said things like it should have a nice, light feel because it's a summer course and then he went away with it and kind of did a mock up that was fabulous. (Dr. Shaker, interview, May 2, 2001)

As Figure 2 shows, the first version of their website was simple, playful, incomplete, and otherwise representative of a first draft. Having a first site, a first level representation, however incomplete and incorrect it may have been, galvanized the group. It gave them something to critique and think about. Suddenly they had something to work with—something to hang their ideas on.

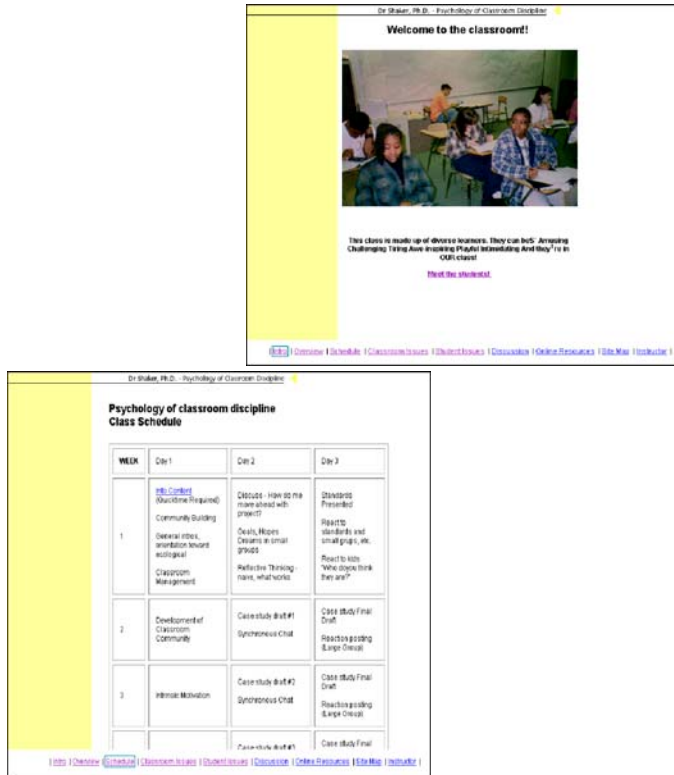


Figure 2. First website created by Dr. Shaker’s group

Dr. Shaker had an initial idea of having teachers read different student cases that reflected different issues related to classroom discipline. In fact her idea was to have these cases be the core of the course. This became the significant idea that Clark drew upon as he developed the first version of the web site—with little pictures for each of the kids whose cases would be included. However, once the site was developed the group realized that having pictures of the students biased perception in significant ways. For instance, having a picture of a girl or an African American could possibly turn discussions into areas that the students in the online course were not prepared for. Though these issues of stereotyping were important they needed time and structure to develop fruitfully. This led to further discussions on the timeline of the course.

Dr. Shaker wanted this course to be half as long as her regular course. As Pat wrote, “One of the first things we tried to establish was how to take 16 weeks worth of material and make a 6 week online course out of them.

Six weeks is no time at all. In the end we designed a ‘three lesson’ table” (Pat, final paper, April 27, 2001). Thus the initial web site broke the impasse and led to tentative but fruitful conversations about pedagogy and content. However, the conversations about technology, content, and pedagogy, were still relatively independent of each other.

Stage 2: Solidifying roles, and grappling with the issues

By this time, most groups, either explicitly or implicitly, had solidified the roles and responsibilities for group members. Most groups had a “technology expert,” who had a strong enough background in technology to know how various technology tools could be used to represent the content. In the case of Dr. Shaker’s group, Clark became the Webmaster, taking the ideas from the group and creating newer versions of the web site. Pat had taken on the role of the “teaching assistant” thinking through the pedagogy and structure of the content. Xi on the other hand, provided the student perspective and also offered help as and when needed. Clark and Pat clearly took on leadership roles though in different and nonoverlapping areas. As Pat said,

Our group was diverse in its’ strengths. Dr. Shaker was the leader; she gave us her vision and helped us to shape it in a way that would make her a good instructor. Clark was a capable and willing web designer who was able to take all of our crazy ideas and make sense of them on the Web. Xi brought an international perspective to the group, which was helpful. She also asked several questions along the way about things that the rest of us had not thought of. My job in the group seemed to be to lead us through the process of developing a framework for online learning. I led the group during the discussion of how to translate Dr. Shaker and her materials to the Web. Those discussions were interesting. (Pat, final paper, April 27, 2001)

It was at this stage, where the group had become comfortable with each other, and in their respective roles, that the discussions began to center around issues related to the relationship between content, technology, and pedagogy. This played out in a number of ways. For example, issues of graphic design became central as groups played with different themes and layouts as they tried to find graphics that fit the content, and the desired mood of the course (a factor in pedagogy). However, the design and the content needed to be carefully synchronized with the technology available and what it would let them do. Specifically, during their discussions concerning

the interactions of content, pedagogy, and technology they found that these interactions had an impact on the representation of the content in an online environment.

Thus despite the fact that the group had delegated authority about different aspects to each other—the conversations became more intricate. Each individual needed to understand not just their own needs and requirements but those of the others in the group as well. Moreover, they also had to communicate their constraints (regarding technology, content or pedagogy) to the others in the group. No longer could the group treat these three issues separately.

Another example of the weaving together of these three areas can be seen in the manner in which the group worked on the problem of building community in the online course. This desire to foster a learning community emerged from broader class discussions about the relationship between participation and community in online settings. As a part of this broader discussion, Dr. Shaker's group explored a range of technological tools that allowed participation and interaction (chat rooms, bulletin boards, etc.). However, the discussions and explorations were not restricted just to the domain of technology. The key issue of building an online learning community was explored from a variety of content driven and pedagogical perspectives as well. Some of the issues discussed were the nature of interaction between students and content, between students and the instructor and between students themselves.

I've had to think more carefully about how to build in the kind of collaborative community oriented aspects that are just a part of (my) face-to-face instruction. I've been going back and forth with, I think it's inevitable because it's the way I think about teaching...but I tried to think about how do you provide instruction and provide directed practice and authentic experiences in an online format. That's been the design challenge for me. (I) tried to think about best practices and how to make them applicable and that's really pushed the way we designed the structure of the course because I knew I wanted some interactivity, or a high degree of interactivity. So we spent a lot of time in our small group kicking around some ideas about what might that look like. (Dr. Shaker, interview, May 2, 2001)

There were also discussions related to the "mood" of the web site and how this could influence student perception of the instructor and the course, and how these perceptions could influence student participation. As Dr. Shaker said, "it should have a nice, light feel because it's a summer course...a little playful cuz it's summer" (Dr. Shaker, interview, May 2,

2001). This can clearly be seen in the versions of the web sites created towards the middle weeks of the design (Figure 3). Also apparent are changes in the navigation system of the site as well as the specifics of the timeline of the course. Clearly by this time Dr. Shaker's group was not seeing technology, content, and pedagogy as being three separate areas but rather as being interconnected and interrelated in complex ways. It appeared that issues of online community building were an ideal place to explore the manner in which content, pedagogy, and technology interact.

The figure displays two screenshots of a course website for 'Psychology of Classroom Discipline' by Dr. Shaker, Ph.D. The left screenshot is the 'Welcome' page, featuring a navigation sidebar with buttons for 'one' through 'six' and 'Extras'. The main content area includes a 'Welcome to Class!' message, a photo of Dr. Shaker, and contact information. The right screenshot is the 'Week 1' page, showing a table with columns for 'Materials', 'Day 1', 'Day 2', and 'Day 3', detailing course content and activities.

Figure 3. Intermediate version of Dr. Shaker's course

Stage 3: Bringing It All Together

The primary concern for most of the groups at this stage was on issues of time management for the online students and the online professor. The faculty members had become intensely concerned, sparked by some of the class-wide discussions and the readings we had assigned, on the amount of time faculty members would have to devote while teaching the online course. "I'm concerned about how I manage the workload. What I hear colleagues say is I'm online a lot. You know, you work more in this than you do in a face-to-face course. I'm concerned about that so I want to monitor that" (Dr. Shaker, interview, May 2, 2001). There was also increased attention on how to structure initial student experiences since it seemed clear that initial student perceptions would play a significant role in how students interacted and learned in this new medium. These discussions were reflected in the redesign of the web sites.

In Dr. Shaker's group, there was less discussion at this stage on the look and feel of the course, the content and navigation—issues that had taken up most of the time in the previous stage. Most of these things had been solidified after multiple iterations and exploration. Most of the discussion and work at this stage were on building expectations for the students and the instructor. There was an increased emphasis on community building with issues such as interactivity and intimacy taking on greater importance. As Dr. Shaker said,

I've had to think more carefully about how to build in the kind of collaborative community oriented, and we talked about it as community in the class a lot, aspects that are just a part of face-to-face instruction...One of the first things they do is fill out their profiles, and I've programmed that to be a little bit more directive about information I want from them. And then each week, I ask them to do something that's self-revealing...So I'm trying to think about how to use again some of the more intimacy of the small group or sort of macro intimacy of interacting with me versus the sort of riskier thing of interacting with the whole group and trying to structure it so that they get increasingly more comfortable (Dr, Shaker, interview, May 2, 2001).

Some of these concerns and discussions can be seen in the final versions of the web site (Figure 4). The issues confronted by this group mirrors the larger summaries presented earlier. Instead of turning over the development of their courses to web-programmers, the designers of these courses experienced something quite different. They worked together to design the courses themselves. Along the way, they not only learned new technology skills, they also thoughtfully considered how the technology could be leveraged to accomplish higher-order learning goals for their potential students. These groups became sensitive to the idea that the technology was *not* general purpose or neutral, but rather, aspects of course content and the way Dr. Shaker wanted to teach was intricately connected to what technology they used and how they would use it.

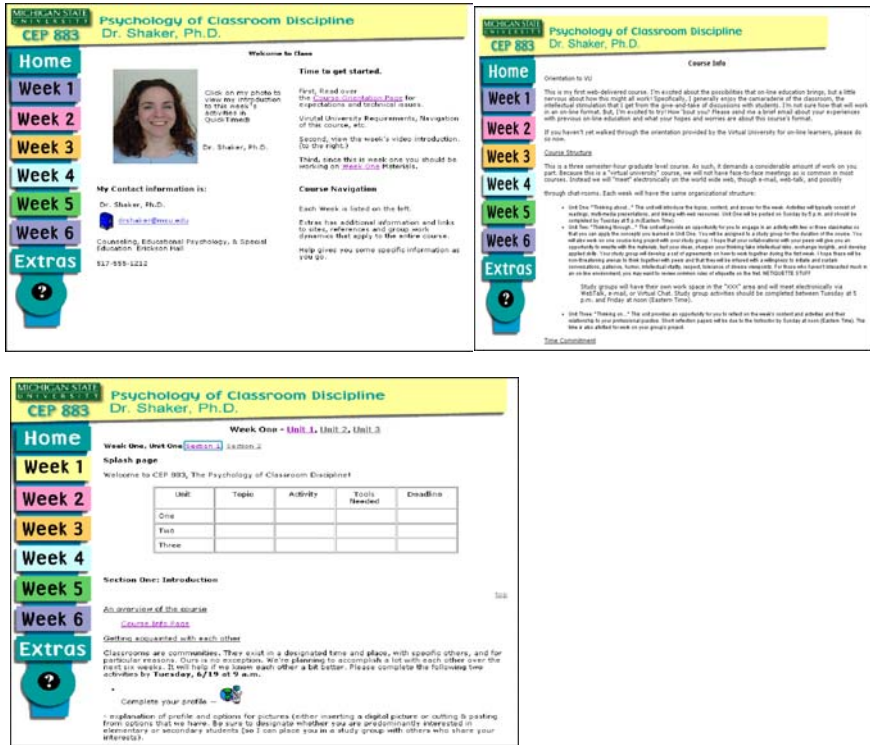


Figure 4. Final version of Dr. Shaker’s course

A TRANSACTIONAL MODEL OF EFFECTIVE TECHNOLOGY INTEGRATION

Experiences provided by observations of design teams, such as those led by Dr. Shaker led to considerations of what is important for learning to teach online. It has always been problematic to draw generalization from a single case study. At one level, there is only one semester of data from one classroom, innovative to the extent that it included faculty and students designing online courses. However, this experience has been a very profitable one in terms of realizing the importance of considering key features of the online world that have to be wrestled with before going online. The key premise is that good online teaching is found only in the marriage of three components that dynamically constrain and interact with each other (Figure 5).

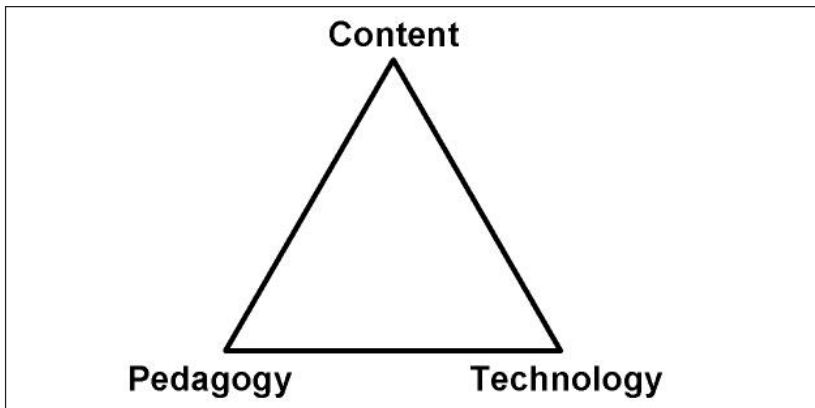


Figure 5. Three components to integrate for good online teaching

This model forms the basis for how we think about the role of technology in teaching. More specifically, it lays out how we think about developing faculty to teach online, and how we think about what happens when groups design online courses.

Content. This refers to the actual subject matter that is to be learned/taught. Clearly the content to be covered in high-school social studies is very different from the content to be covered in a graduate course on political science. In the case of a particular course, this would mean the core ideas, knowledge, procedures, resources (reading lists, etc.) and representations that make up the course and subject matter.

Technology. This encompasses standard technologies such as books and chalk and blackboard, as well as more advanced technologies such as the Internet and digital video. Different ways of presenting and interacting with information on the screen are important factors when considering technology.

Pedagogy. Content and technology have to come together to inform pedagogy. Pedagogy is viewed as the process and practice or methods of teaching and learning and it encompasses (among other things) overall educational purposes, values, aims as well as techniques or methods to be used in the classroom, the nature of the target audience and strategies for evaluating student understandings.

There are two levels at which this model works. In one level the instructor has a model, or representation, of how content, pedagogy, and technology come together to give the course coherence. The other level is how that model is represented and communicated to students. In an online course, the representation (i.e., the website) is the only way to convey the course content, pedagogy, and technology to the students. Thus the design of the site is key to the success of the course.

In the case of the traditional VU model presented earlier, the producer becomes the primary decision maker—bridging the gap between the content expert and the technologies used to instantiate the course content. The instructor's representation of the course is filtered through the perceptions, knowledge, and biases of the producer, who may or may not understand the complex ways in which instructors think about the content (Shulman, 1986). These include the representation and formulation of concepts, pedagogical techniques, knowledge of what makes concepts difficult or easy to learn, knowledge of students' prior knowledge and theories of epistemology. It is important that instructors have a direct involvement with how content, pedagogy, and technology come together.

This is important not just because instructors are content and pedagogical experts, but also because the formulation of representations to be communicated to students is an iterative process. As instructors move their content and pedagogical values into a new environment, they are forced to not only think about how the model in their head is communicated to their students, but they are also moved to question their own ideas about how the components of the model are integrated (Foshay & Bergeron, 2000; George & Camarata, 1996; Harasim, Hiltz, Teles, & Turoff, 1995; Kimball, 1998). Empowering instructors allows them to have a greater degree of flexibility and control over the design of the course.

Clearly, separating the three components (content, pedagogy, and technology) in our model is an analytic act and one that is difficult to tease out in practice. In actuality, these components exist in a state of dynamic equilibrium, or as the philosopher Kuhn (1979) said in a different context, in a state of "essential tension." The traditional view of the relationship between the three aspects would argue that the "apex" of the triangle would drive most decisions: the pedagogical goals. However things are rarely that clear cut, particularly when newer technologies are being used. Technologies often come with their own imperatives that determine the content that has to be covered and the kinds of representations possible. These decisions can have a ripple effect by defining, or in other ways, constraining instructional moves and other pedagogical decisions. The advent of online education at

our university and elsewhere can be seen as an example of technology and other social pressures forcing people to think about pedagogy online. So in this context it is the technology that pushes the other “vertices” to rearrange themselves. A good example is the manner in which Dr. Shaker rethought her course objectives once Clark posted the first version of the web site.

Viewing any of these vertices in isolation from the others represents a real disservice to good teaching. Decisions about any one of these elements have implications and consequences for the other two. For example, teaching chemistry (the content) would drive the kinds of representations to be used (symbolic representations such as equations or visual representations such as molecular diagrams) and the technologies used to display and manipulate them. An example, in the case of chemistry, would be the use of special plugins, such as the CHIME plugin, that would allow students to dynamically view and manipulate molecular representations. If, on the other hand, the technology currently available would not support the writing of equations or representations, it would force the instructor to develop other ways to represent content and thus impact pedagogy. Consider another example, if the course content is about learning simple facts about the properties of each of the periodic chemical elements, then some pedagogical representations (e.g., essays) are not as attractive. Likewise, a course about film might require certain technological tools (like video). These interactions go both ways, deciding on a particular technological tool will offer constraints upon the representations that can be developed, the course content that can be covered and delivered, which in turn effects the pedagogical process as well.

Teaching and learning with technology exist in a dynamic transactional relationship (Bruce, 1997; Dewey & Bentley, 1949; Rosenblatt, 1978) between the three elements. A change in any one of the factors has to be “compensated” by changes in the other two. Thus designing an online course is the process of constructing this dynamic equilibrium of the three components. Of course, this was always true of any kind of teaching. However, when we talk about traditional face-to-face courses, these issues often remain in the background, because with years of practice and familiarity, faculty develop a series of pedagogical scripts that allow them to function without reflection. The content seems tried and true as does the kinds of representations we use. In addition the technologies we use become invisible—in that, we often do not consider them as being technologies at all (good examples being chalk boards and overhead projectors).

The incorporation of a new technology or new medium for teaching suddenly forces us to confront basic educational issues since this new technology or medium changes the relationship between all three elements. The medium, and one that we are concerned with in this article, is that of online

education. The relative newness of the online technologies forces faculty members who are developing online courses to deal with all three factors (and the relationship between them) at the same time—something they may not have done in a long time. The addition of a new technology is not the same as adding another module to a course. It often raises fundamental questions about content and pedagogy that can overwhelm faculty. In this situation it becomes important to develop better ways of helping and supporting faculty members as they develop and teach technology rich or technology dependent courses, such as the design approach presented in this article.

DISCUSSION

How are institutions to meet the challenge of developing faculty members who will succeed at online teaching? Analyses from this research have revealed that when experts in pedagogy are given opportunities to design online courses, they consider how content, pedagogy, and technology all influence each other. Admittedly, this approach might not be an institutional answer—the efforts described in this article succeeded, in part, because the faculty and college were willing to devote the resources needed to make it work. Faculty members actually gave up at least 10 hours of their week for an entire semester to be a student in the design class. That is a big commitment of resources as well as testimony to how serious these faculty members were about their teaching.

Ultimately, it is argued that any successful faculty development approach has to find ways to let faculty experience the interaction of these three components and become sensitive to the ways in which they coconstrain each other. Most traditional approaches in the form of technology workshops, seminars, or courses fall short of this mark. In contrast, this study of the design team approach shows that these considerations can be at the center of course design.

The design approach to faculty development has proved to be a fruitful lens for considering the many avenues of professional growth required to enter the world of online teaching and learning. Instead of turning over the development of their courses to web-programmers, the designers of these courses experienced something quite different. They worked together to design the courses themselves. Along the way, they not only learned new technology skills, they also thoughtfully considered how the technology could be leveraged to accomplish higher-order learning goals for their potential students. At the very least, this approach shows what is possible, and worth exploring to see how far it can go, and how broadly it applies. Based

upon these experiences, the first two authors that taught the design course continue to teach, design, and redesign this course to further develop faculty and students towards the challenge of teaching online.

Finally, consider how far some faculty came. This is how Dr. Shaker described her mindset at the beginning of the semester:

I don't know a lot about the technical stuff of the computer. I don't feel like I want to know that, or need to know that.... I don't need to know how to compress stuff and, you know, other people can do that. That's not what I wanna do. I don't know how the telephone works either. Nor do I care. (Dr. Shaker, interview, May 2, 2001)

Consider now what Mr. Ott, Dr. Shaker's producer at VU said when the course designed by Dr. Shaker was implemented:

Dr. Shaker's been changing with that stuff (sic) all semester and it's great, it's been nice to watch. When she first started she just changed text, now she puts in links, she adds papers up to the server and then links to them, she changes different HTML things...one of the things that she does is she records her weekly feedback to the students and then converts that to a real audio and puts it on the server...she doesn't have to bother about sending it to me and then worrying whether I did it right or not and she can also do it while she's on vacation or what ever. (Mr. Ott, interview, July 25, 2001)

For someone who was not interested in technology at all, the above quote reveals a significant shift in perspective. And this shift came about not due to any newfound love of technology but rather because a good teacher wanted to do the best by her students and realized that separating technology from content and pedagogy would be inappropriate. Technology, for Dr. Shaker, was no longer Somebody's Else's Problem—it was something that she had to deal with if she wanted to be a good teacher in this new medium. Clearly one semester had not made her an expert web designer or digital audio engineer but again that was not the goal of the semester. What she had become was a better teacher more sensitive to the nuances, complexities, and possibilities of teaching and learning with technology.

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Notes

1. Contributions of the first two authors were equal. We rotate the order of authorship in our writing.
2. All names are pseudonyms.
3. Our point is not that workshops or tutorials lack value. On the contrary, such short, technology and skill focused sessions can be extremely useful. They allow participants to learn the fundamentals of specific technologies and lay the foundation for more advanced learning. However, such interventions do not offer opportunities to explore the connections between technology, content, and pedagogy—something essential for quality technology integration.
4. We must add here that there have been some significant changes in the manner in which VU operates in the time between the writing of this paper and its publication. These changes blur the lines that sharply divided the faculty member from the producer. Constraints of space prevent us from describing these changes in any detail though it would be interesting to study just why these changes did take place.
5. Our argument is not that faculty members should become technology experts. However, we do believe that faculty members need to develop a fundamental grounding in technology, its affordances and constraints. This grounding would not be through the development of a “basic curriculum” (what every faculty members needs to know) but rather developed through engagement with real pedagogical issues and real technologies.
6. The sixth course will be taught in an upcoming semester.